



MACHINE AND TOOL

blue book

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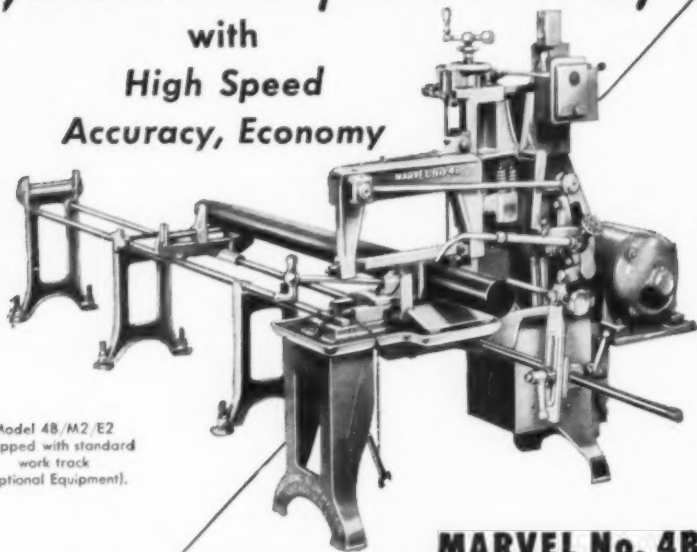
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a hitchcock
publication

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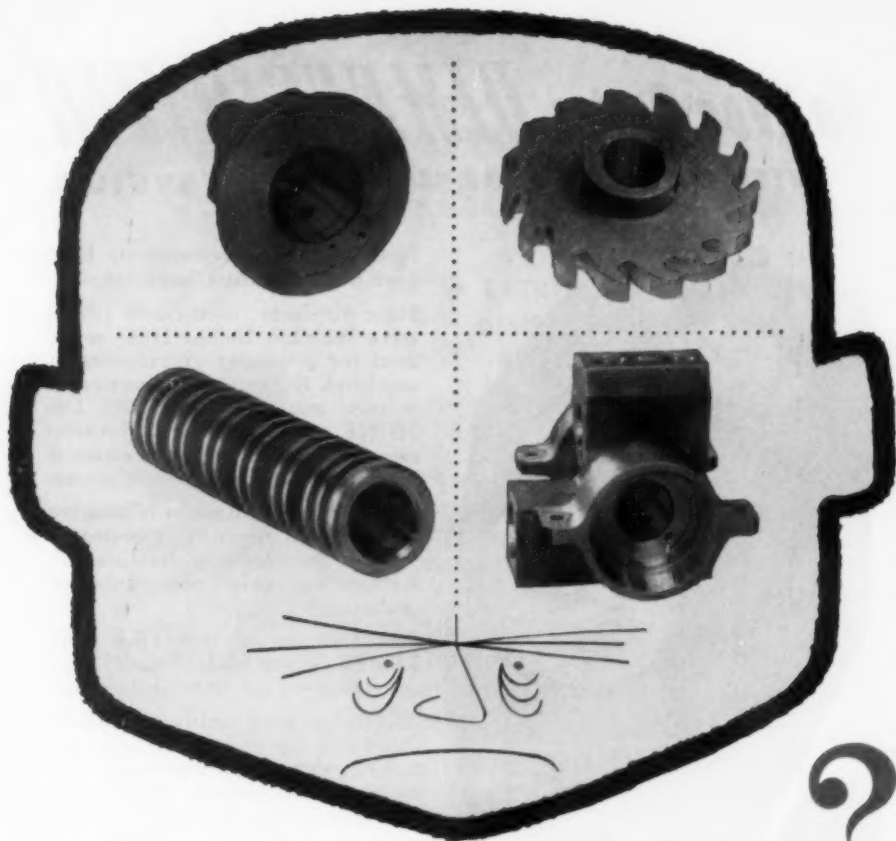
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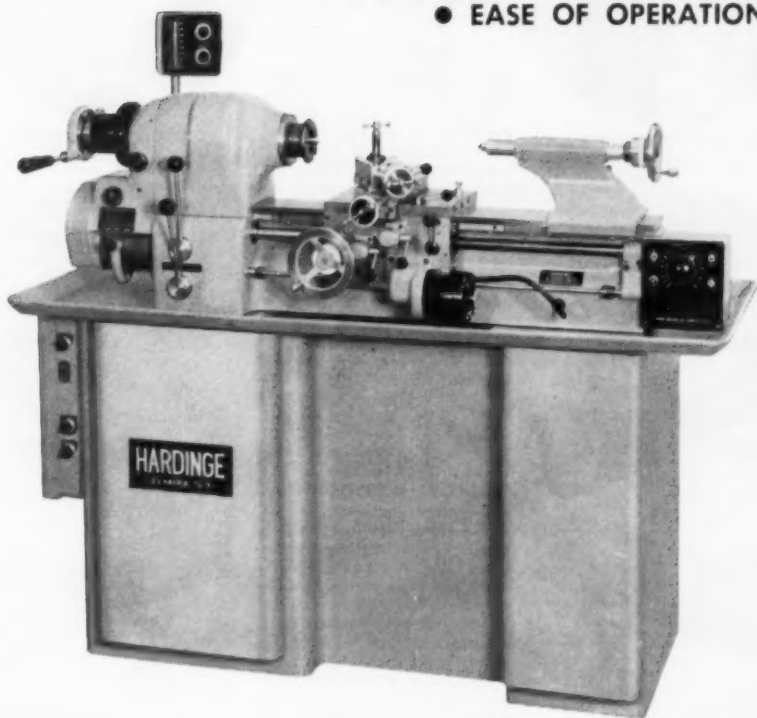
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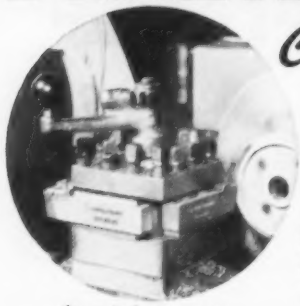
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May, 1957

ARMSTRONG

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TOOL HOLDERS



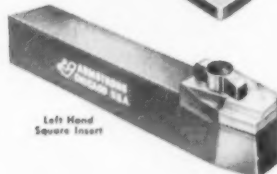
for use in clamp type rests



for use in conventional tool holders



Right Hand
Square Insert



Left Hand
Square Insert



Right Hand
Triangular Insert



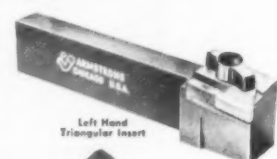
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READER'S GUIDE

MACHINE AND TOOL

blue book

MAY, 1957

VOL. 52 - No. 5

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BPA

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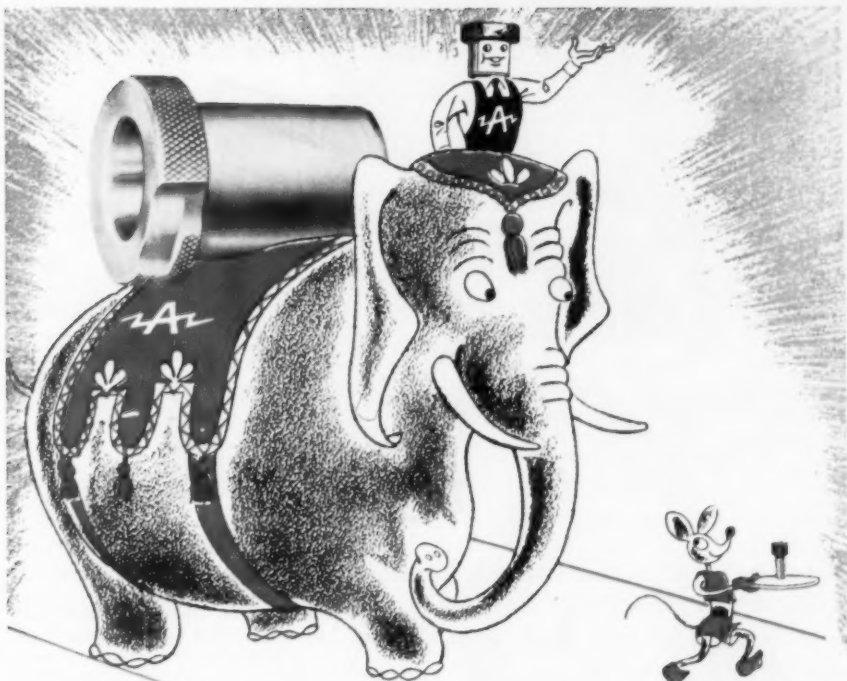
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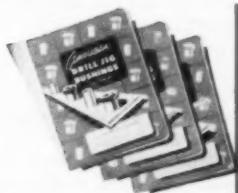


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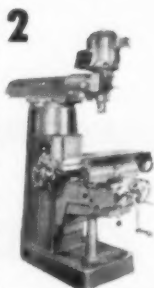
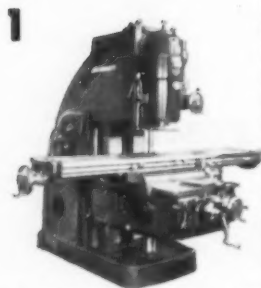
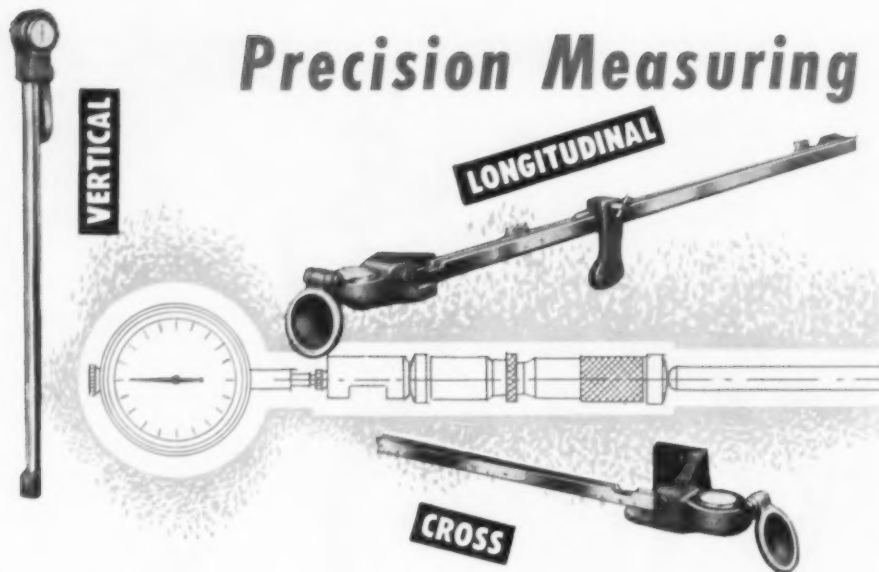
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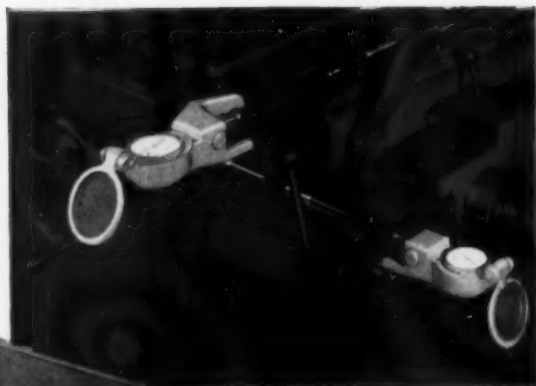
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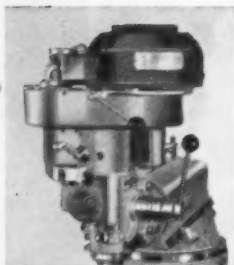
cator and a steel trough in which a "stick" micrometer and standard measuring rods can be placed. It can be obtained for longitudinal cross and vertical movements. Best results are obtained when the milled surfaces or bored holes are not too far apart, say within $\frac{1}{2}$ the length of the saddle. Write for literature. Publication No. M-1763.

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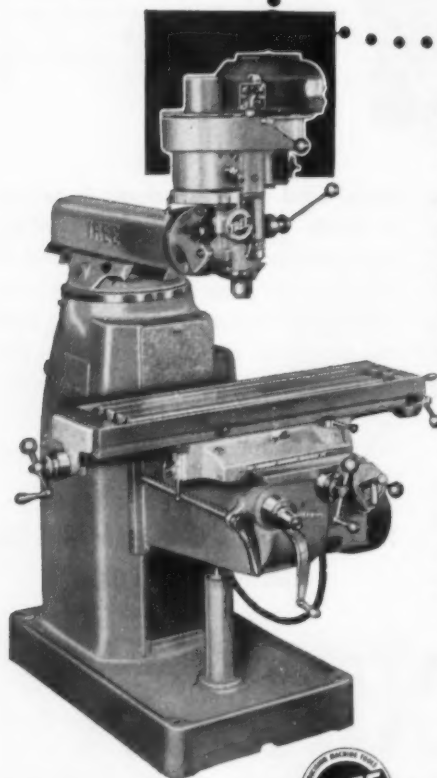


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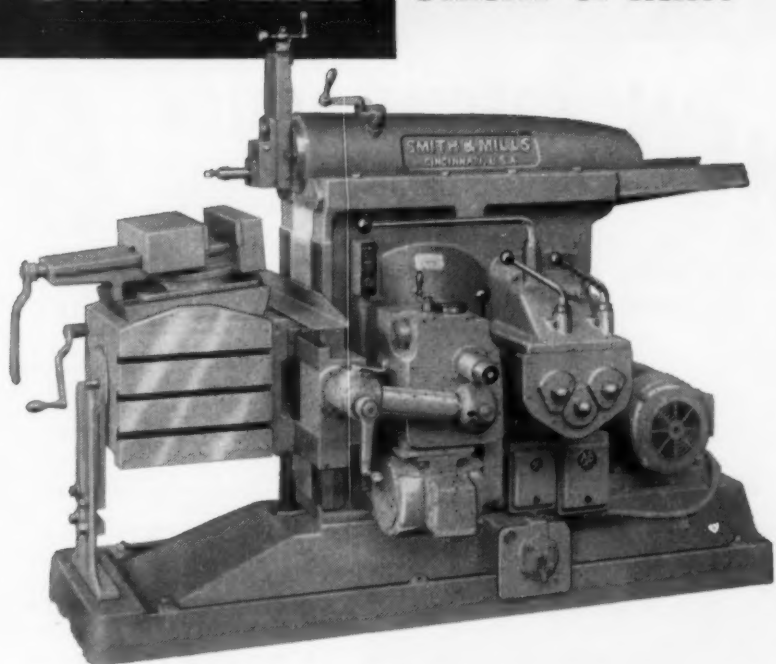
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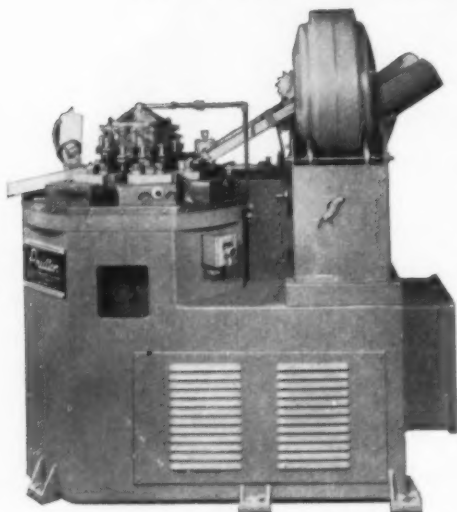
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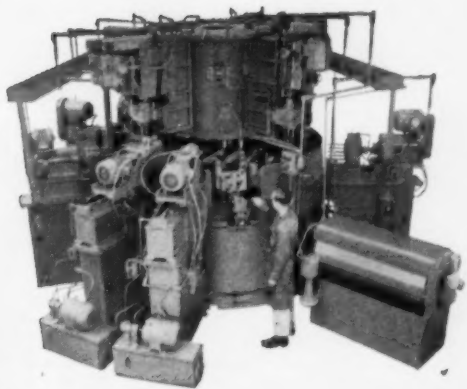
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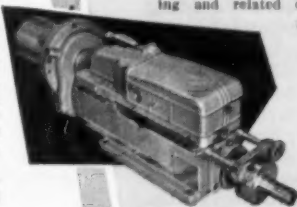
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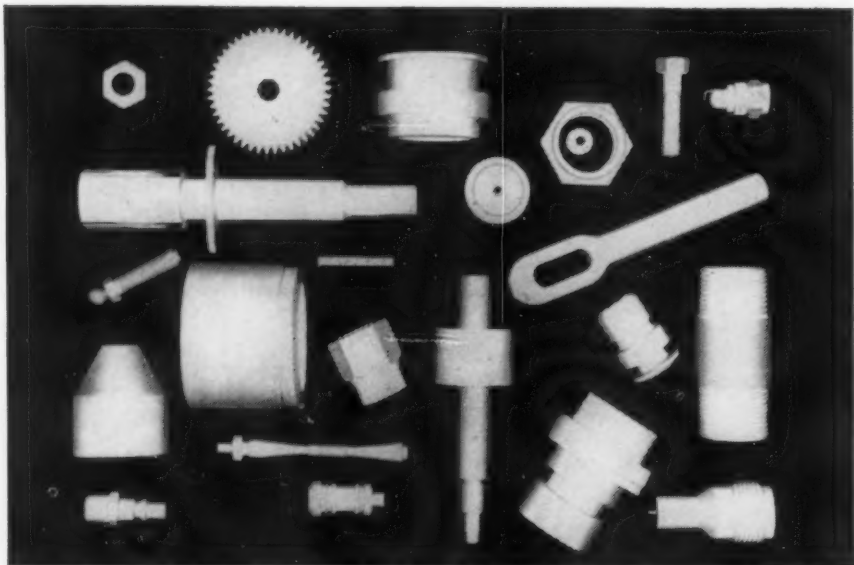
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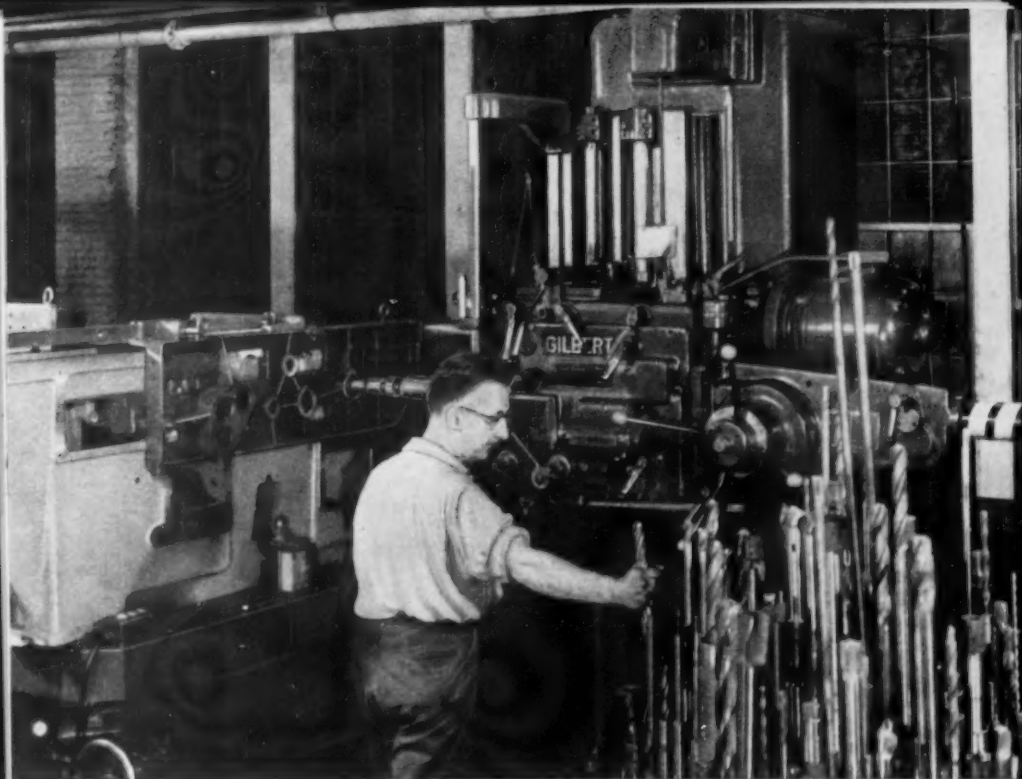
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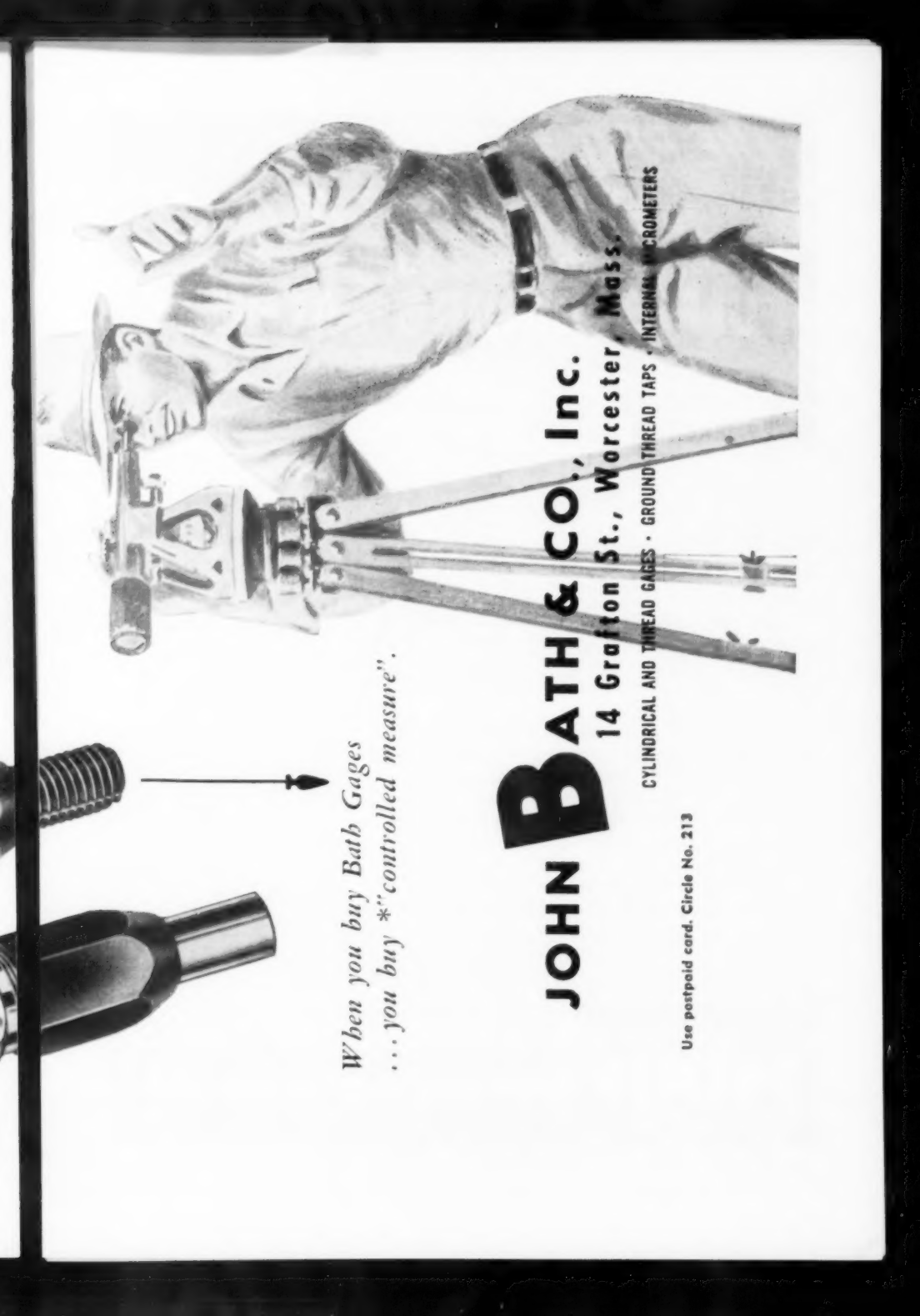
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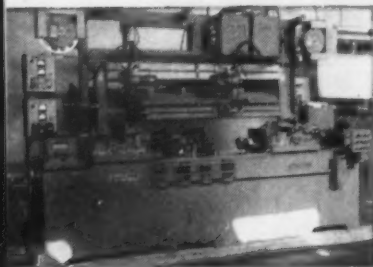
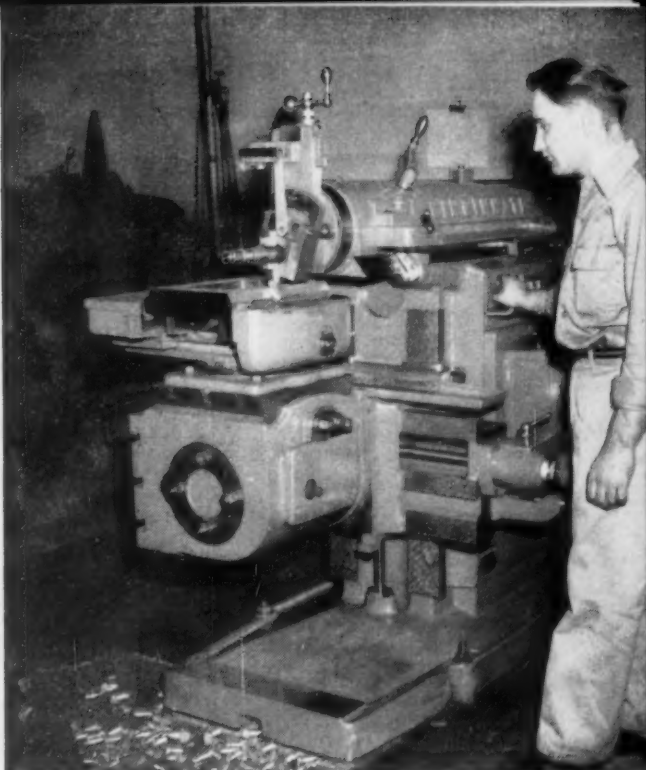
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Accurate heavy cuts by this Cincinnati Rigid Shaper

... at NATIONAL
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Bay City, Michigan



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Photos courtesy National Electric Welding Machines Co., Bay City, Michigan.



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That we
The Morse Twist Drill & Machine Company

A corporation duly organized under the laws of the Commonwealth of Massachusetts, and doing business at New Bedford, in the County of Bristol, in said Commonwealth; in consideration of good and current coin of the realm, in amounts as set forth in the catalogue of good and current coin which can be readily obtained upon application - will give, grant, bargain, sell and convey unto dealers and users of Machinists' Tools, located in every part of the civilized world, certain tools (hereinafter mentioned) made of the best quality of steel, of fine finish and not excelled as to durability and accuracy. Said tools consist of:

Arbors for Drill Chucks, Shell End Mills, Shell Reamers and Face Milling Cutters; Bench Section and Center Drill Chucks; Counterbores; Countersinks; S-Ind and Adjustable Counterbores with Bit Point Drills, Dies, Bit Point and Bit Stock Drills, Increase Twist and Constant Angle Drills, Three and Four Flute Drills, Drills with Grooved Shank, Hollow Drills for deep drilling of long holes, Jobbers' Drills, Letter Drills, Drills with Flat and Ring, Twist Drill and Steel Wire Gauges; Mandrels, Metal Slitting Saws, Milling Cutters, Concave and Convex Cutters, Cutters for Grooving Taps; Cutters with Radial Grooves; Screw Cutting Cutters; T Slot Cutters; Gang Cutters; Sprocket Wheel Cutters; Interlocking Cutters; Involute Cutters; Cutters for Miter and Bevel Gears; Stocking Cutters for Involute Gears; Adjustable Hollow Mill; End Mill; End Mill with center cut; Shell Bit Stock Taper Reamers; Shell Reamers; Expanding Shell Reamers; Fluted Chucking Reamers; Rose Chucking Reamers; Shell and Rose Shell Reamers with Spiral Flutes; Taper Pin Reamers; Bridge Reamers; Locomotive Reamers; Three-Flute Chucking Reamers; Screw Plates with Dies, Sleeves, Sockets; Machinists' Hand Taps; Machine Screw Taps; Nut Taps; Patch Taps; Pully Taps; Pipe Taps; Stay Bolt Taps; Stone Bolt Taps; Machines as follows: Bench Centers, Drill Grinding, Face Grinding, Gear Testing and Straightening Press.

So **Morse and Co Hold** said tools with all the privileges therein belonging to their own use and behoof forever; That we have good right to sell and convey the same as aforesaid, and that we will warrant and defend the same to said grantees.

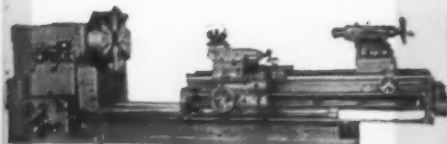
In Witness Whereof, We, the said Morse Twist Drill & Machine Co., hereunto set our hand and seal this Sixth day of April, A. D.

Morse Twist Drill & Machine Co.

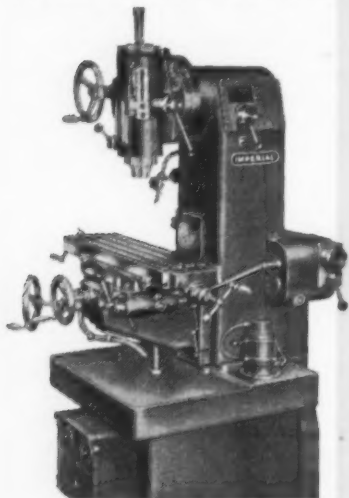


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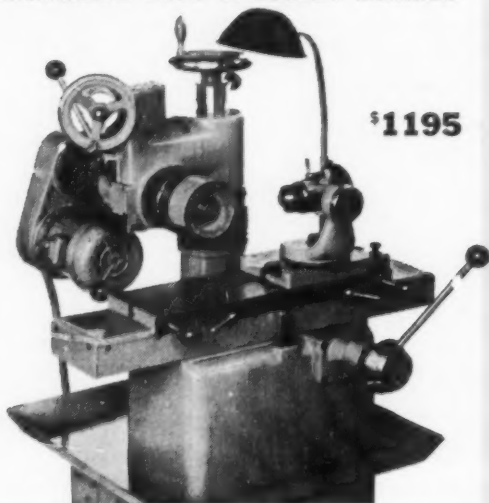


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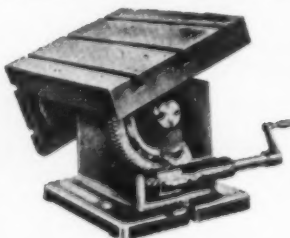


\$1195

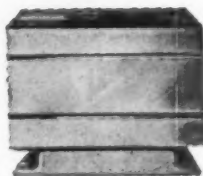
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 from **\$349**



3 sizes available
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See page 51

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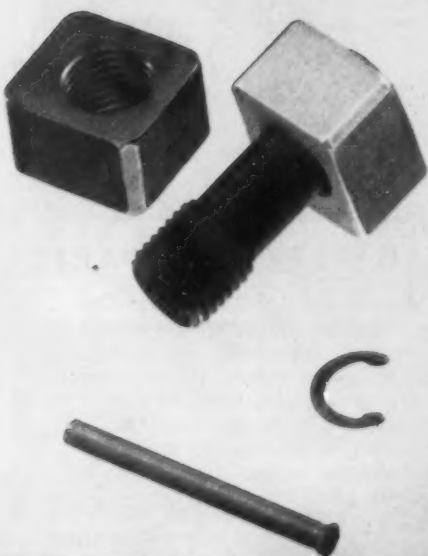
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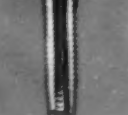
The Jacobs Model 91 Spindle Nose Collet Chuck for tool room and engine lathes.



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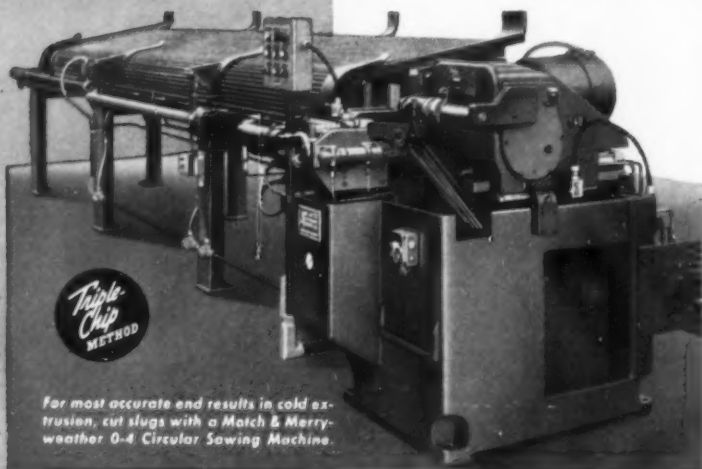


The Jacobs Ball Bearing Super Chuck for heavy duty and precision industrial use.

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*Triple
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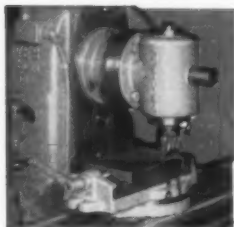
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MOTCH & MERRYWEATHER
MACHINERY CO.

MACHINERY MANUFACTURING DIVISION
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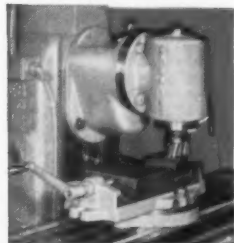
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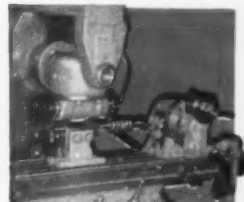
MACHINE and TOOL BLUE BOOK



Heavy Duty Vertical
Milling Attachment



Heavy Duty Offset
Vertical Milling Attachment



Universal Milling Attachment



Toolmakers Overarm

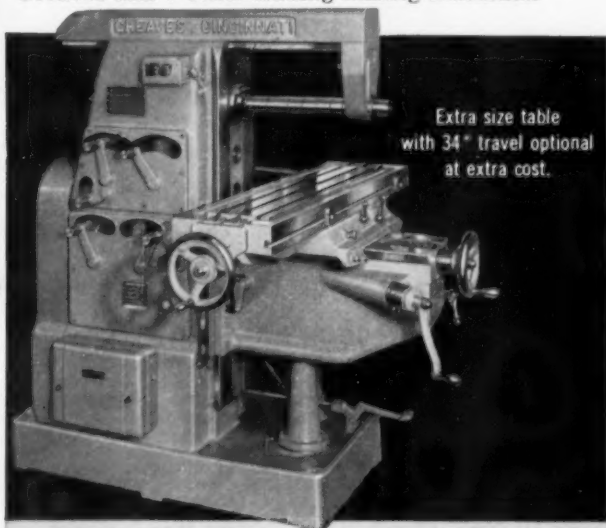
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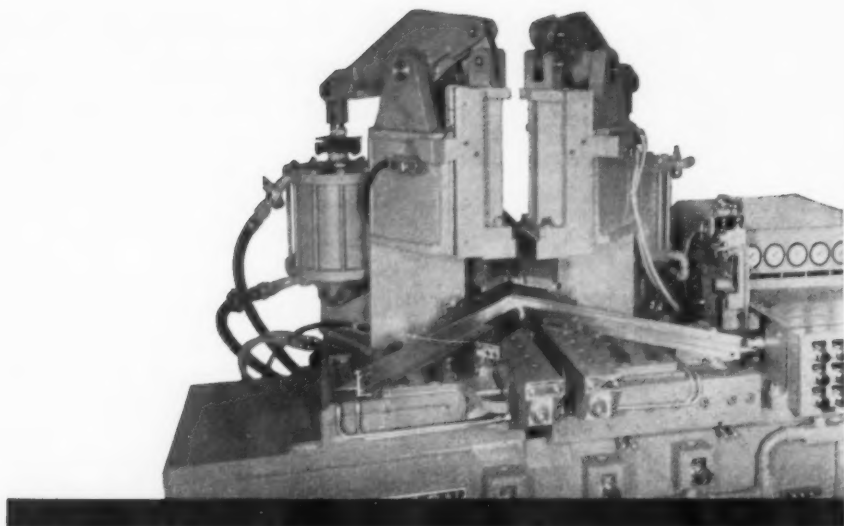
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PRK • 33 TOOL STEEL

(Cobalt, High Carbon, High Chrome)

***Holds its edge at 1000° F.!**

Above is the Thomson Synchro-Matic Flash Welder performing a miter weld on an aluminum window extrusion. "Pinch-off" dies of PRK-33, a Thomson development, support the work close to the point of weld. After welding, this PRK-33 die moves in to pinch off the flash close to the surface of the work. Eliminates most cleaning and finishing of the weld.

After testing many die steels, Thomson now specifies PRK-33. They have found PRK-33 to be the finest high carbon, high chrome, with cobalt, die steel available. Its production record, its ability to hold a hard edge at high temperatures far surpassed all other die steels tested. Heat treated and double drawn at 980°F. gives PRK-33 a secondary hardness of 59-61 Rc.

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AVAILABLE IN 0"-1", 1"-2", AND
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FEATURES OF ADVANCED DESIGN

- 1. Large-diameter thimble is easy to read** — Clean-cut black graduations and numbers are widely spaced for fast reading, on a rust-resistant, dull chrome finish.
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Twelve new Brown & Sharpe micrometer calipers, utilizing hardened steel spindle faces, offer worthwhile savings in price for economy-minded mechanics. These mikes bring you at low cost the many famous Brown & Sharpe features that make precision measuring easier and surer. Choose them for reliable accuracy . . . you'll be making a wise investment!

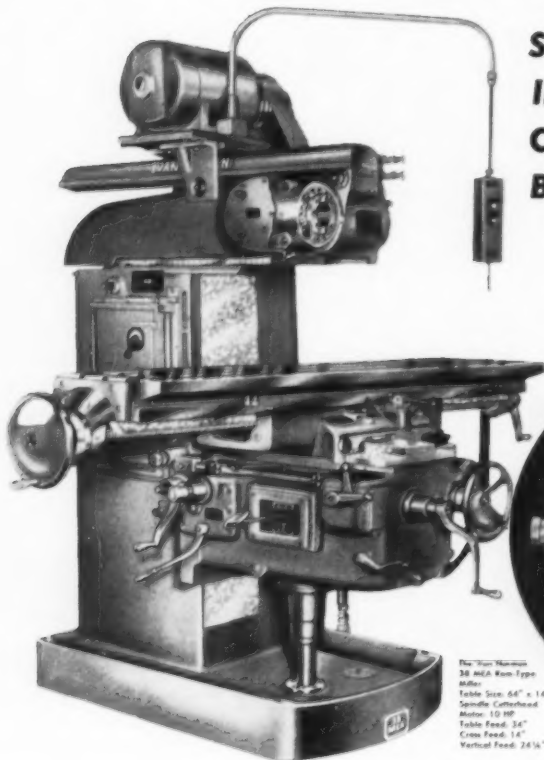
WRITE FOR FULL DETAILS on this high-quality, lower-cost line. Brown & Sharpe Mfg. Co., Providence, R. I.

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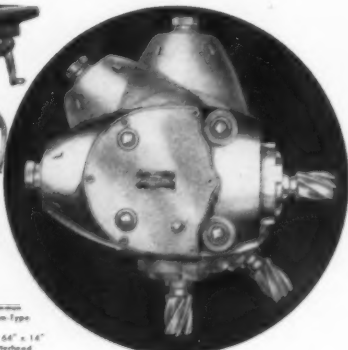
One Van Norman

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**Saves You
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Table Size: 64" x 14"
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Revolves: 110 RPM
Table Feed: 14"
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*This Van Norman adjustable cutterhead
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You can substantially cut the size of your investment and, at the same time, increase your production and reduce milling costs — all through the purchase of one Van Norman Ram-Type Miller.

Available for all types of work, Van Norman Ram-Type Millers permit horizontal, vertical and angular milling without attachment — they reduce idle machine and operator time.

Get complete details on the Van Norman 38 MEA, or on any of the many Van Norman Ram-Type Millers. Write, wire or telephone for catalog.

Don't wait . . . for extra profit install a Van Norman machine now! They are available on many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export.

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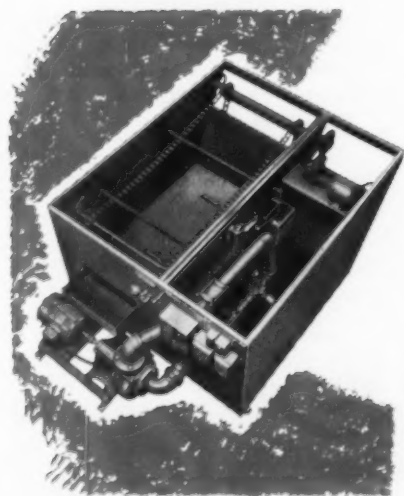
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Filter-Matic

TUBULAR SCREEN VACUUM FILTER



The response to DELPARK'S FILTER-MATIC vacuum filter has been tremendous. The reasons for such interest is obvious. The DELPARK FILTER-MATIC occupies a minimum of floor space, yet it handles an extremely high rate of flow. With these features, DELPARK engineering has achieved such a high degree of filtration that low micro-inch production finishes are easy to attain.

Permanent filter media used in the DELPARK FILTER-MATIC may be used without filter-aid. Where absolute filtration is required, precoat may be used as needed. Capacities 5-1000 g.p.m.

Write giving complete details for more information on DELPARK FILTER-MATICS as applied to your filtration problems.

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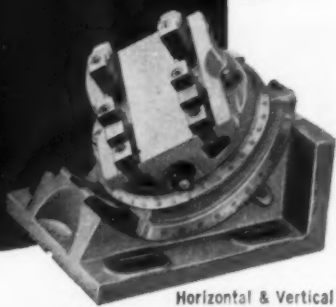
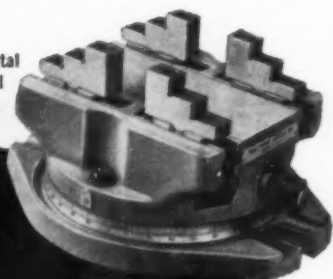
INDUSTRIAL FILTRATION COMPANY

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MULTI-PURPOSE WONDER GRIP VISES

4 STEPPED JAWS PERMIT CLAMPING of rough castings, irregularly shaped, round, and tapered pieces accurately and quickly, eliminating need for special jigs or fixtures. Narrow stepped jaws allow free access to and measuring of work pieces and provide clearance for cutting tools. Small work pieces machined on three sides without reclamping. Easy and quick to mount and align on any machine. Holds rigid in any position without vibration. Various capacities and extra soft jaws available.

Horizontal
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Reversible safety tapping attachments with adjustable graduated friction drive, hardened, ground and lapped, complete with torque bar and handles. Precision made throughout by long established reputable West German factory.



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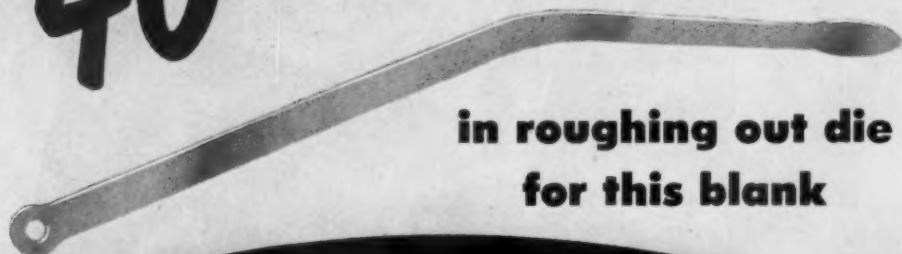
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40%

SAVINGS



**in roughing out die
for this blank**

How it was done . . .



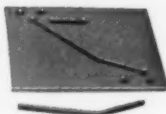
1 First the 7 1/2" slug was removed from the 2 1/4" cast iron shoe.



2 Then the slug was sawed from the die (1" tool steel).

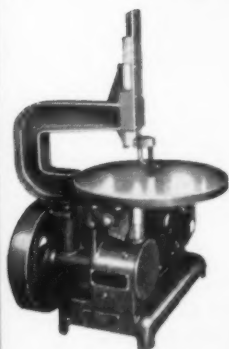


3 The third operation was the punch holder (1" cold rolled steel.)



4 The slug was removed from the stripper plate (3/4" cold rolled steel).

SAW - FILE - LAP with OLIVER of ADRIAN DIE MAKING MACHINES



BENCH MODEL

. . . one of the five types in two sizes.

Yes, using the Oliver die making machine saved 40% of the time normally required for roughing out the die for the blank above. The opening has smooth sides, has no rough edges to chip off—and is within .010" of the finished outline. Similar savings can be had on template and cam work.

Oliver die making machines utilize power contour sawing—reduce filing to a minimum. Table tilt produces clearance for die work while filing. Saws, files, lapping sticks and hones can be used interchangeably.



HEAVY DUTY MODEL

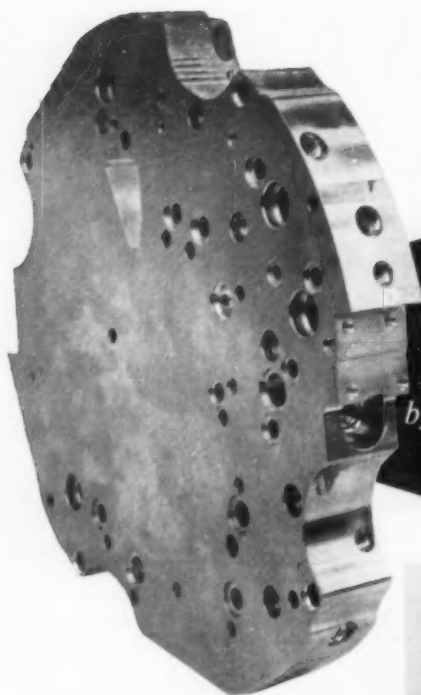
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OLIVER INSTRUMENT COMPANY

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SWISS CHEESE
 by **BURGMASER®**
 turret drills

Here's how CONVAIR managed this precision work: "The manifold consists of a multi-hole pattern in a magnesium disk over one foot in diameter and almost two inches thick. These holes, to be produced on both faces and the periphery, varied both in depth and diameter, requiring many single and combination tools and taps; all to be held to close tolerances. The solution to this task was found in a tandem of three ram type BURGMASER radial turret drills. These versatile machines allowed us to produce all the required machining with a minimum of set-up, tooling, operation time, transfer time and maintenance."



The Burgmaster Model 2 BR (6 Spindle) Ram Type Radial Turret Drill with Automatic Power Clamping features power indexing and a new sensitivity in handling. When the ram is clamped in position, the 2 BR can function as a deep throat production turret drill, easily handling holes up to $\frac{3}{4}$ ". The machine has a 250° radial movement with maximum and minimum radii of 42" and 15", respectively.

For complete details, write Dept. MT-5.



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Hand Operated

Model 618PT
Power Table
Hand Cross Feed

Model 618P
Power Table
Power Cross Feed

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REID
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Three 6-18 Models . . . for Toolroom and Production Grinding

REID . . . the quality name in surface grinders . . . now has three different models in the 6" — 18" size. If your production schedule demands maximum automation, there's a REID 618P with power table and power cross feed. A REID 618PT with power table and hand cross feed is also available.

For tool and die makers, the hand operated 618H is ideal for precision grinding. On all models, a Cross Slide Lock is included as standard equipment.

Compare . . . check the extra features on all REID grinders . . . and standardize on quality. For complete details on models shown, write for Bulletin 618.

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Capacity: 6" wide, 18" long, 17 1/4" from spindle center to table. Standard wheel 7" x 1/2" x 1 1/4" included

Worktable: 51" x 6" overall; 6" x 18" working surface

Table Speed: Infinitely variable from 12 to 25 RPM

Cross Feed: Infinitely variable from .005" to .100"

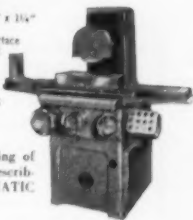
Floor Space: 71" x 43 1/2"

Weight: 2400 lbs.

Electrical: 3 phase, 60 cycle, 220, 440 or 550 volts

All Models Equipped with Automatic Lubrication as Standard Equipment

For Toolroom and Production Grinding of larger capacity, write for bulletin 824 describing our New All Electric 8-24 REID-O-MATIC Surface Grinder.



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TOP FIRMS SHOW PROVED SAVINGS UP TO 75%

IN SET-UP AND GRINDING TIME
WITH CONTINUOUS WORK INSPEC-
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When working with TUNGSTEN CARBIDE, STAINLESS STEEL, STELLITE or TOOL STEELS, VISUAL GRIND permits a semi-skilled operator to grind precision pieces without continued checking with the comparator. Automatic inspection is accomplished with the built in optical comparator.

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This time saver will quickly pay for itself in your plant

For turning between centers, give your present lathes the time-saving advantages of the same **+GF+Work Driver** used on the world famous George Fischer Lathes. Clamps and unclamps with a slight turn of the hood. Clamps rough or smooth blanks and out-of-round forgings evenly. Automatically matches clamping force to cutting pressure. No fussing with driving dogs, no time-wasting hand wrenching.

Five models of the **+GF+Work Driver** give capacities of 1/4" to 8-1/16"—each model drives a wide range of diameters. Write for the **+GF+Work Driver Bulletin**, with full information, specifications, and applications.

Skinner Chuck Company is national distributor for the **+GF+Work Driver**. Sales are handled through Industrial Distributors, Machinery Dealers, and Machine Tool Builders.

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THE SKINNER CHUCK COMPANY

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NEW BRITAIN, CONNECTICUT

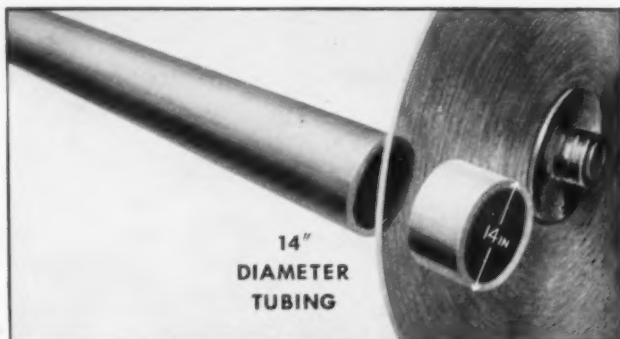


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Know-How is just as vital to top performance in abrasive cutting as in any other machine tool operation

BETTER TUBING CUT-OFFS UP TO 14" DIAMETER



• The fastest, lowest-cost, highest-quality cut-offs of almost any tubing material, *in sizes up to 14" diameter*, can be obtained by abrasive cutting...with absolute minimum of burr.

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The full line of Allison Wheels...rubber or resinoid bonded for wet or dry cut...includes many wheels that are especially designed for Tube Cutting Service.

Allison Field Men...all of them Abrasive Cutting Specialists...have the specialized Know-How, and the wheels, to help you arrive at the best answers to your specific problems. Please ask for their help, without obligation.

Abrasive Cut-Off is the Ideal Method for tubing...tool rooms...job shops...high temperature alloys and tough titanium...heat-sensitive metals...solids up to 12" billets and many other jobs.



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MACHINE and TOOL BLUE BOOK



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featherweight
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works in
any place your
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The famous PG-K-1030L Die Grinder has many great features that make it right for you!

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Model PG-K-1030L Midget Collet Die Grinder for use with mounted wheels, points and burrs. Complete with wrench set, collet guard, 8' length ¼" leader hose.

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Power to spare

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You boost production and cut costs on close, precision jobs... all with less worker fatigue!

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The PG-K-1030L is typical of our complete line of high efficiency air tools built for any power tool application.

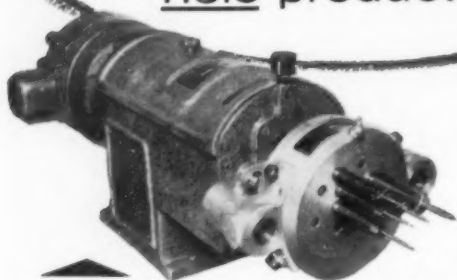
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The Versatile Tap and Drill Team for your hole production



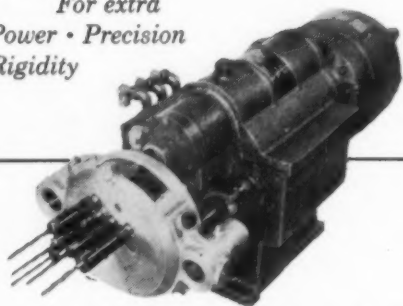
Tapping Unit A.T.U. #3

Completely self-contained all-electric lead screw precision unit. Quickly interchangeable for a fast single or multiple spindle head operation. With forward and reverse electro-magnetic clutches and variable torque control.



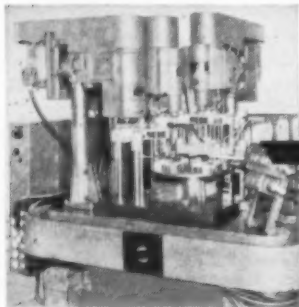
TAP & DRILL TWINS

*For extra
Power • Precision
• Rigidity*



Drilling Unit D.U. #2

Completely self-contained precision unit with powerful air feed and hydraulic control. Quickly interchangeable for fast single or multiple spindle head operation.



Special Machines

Building the Twins into high production special machines is simple, because all units are electrically controlled and all components are standardized equipment. We can supply the assembly complete with tooling — or you can do it in your own plant.

Used singly or in combination they offer the flexibility and adaptability to meet modern drilling and tapping requirements. When combined with Ettco-Emrick multiple spindle heads they'll set new standards of precision, speed and economy. Write for details!

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MANUFACTURER OF
DRILLING AND
TAPPING EQUIPMENT
COVERING THE
ENTIRE SMALL
HOLE FIELD!**

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TAPPING ATTACHMENTS • MULTIPLE HEADS • DRILLING & TAPPING UNITS AND MACHINES • SPECIAL MACHINES • INDEXING FIXTURES • TAP & DRILL CHUCKS

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MACHINE and TOOL BLUE BOOK

**How to lower your production cost
with the right Spindle for your job
and the right Spindle Service**



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POPE designs and builds precision anti-friction bearing spindles — belt driven, motorized or high frequency — for your standard or special machines for milling, boring, grinding, drilling, cutting and many other operations. *More than 20,000 different Spindles to choose from.*

POPE builds spindles to your design.

POPE builds special spindles for use in your own shop for grinders, boring machines, etc.

POPE provides standard replacement spindles for your present shop equipment.

POPE provides repair and rebuilding service for any make of spindle — belt driven, motorized or high cycle.

POPE provides precision parts for your spindles, such as shafts, flingers, locknuts, sleeves, spacers, etc.

POPE provides interchangeable extension arbors for your internal grinding spindles — wheel holders for any spindle — any size wheel. Just send us your specifications.

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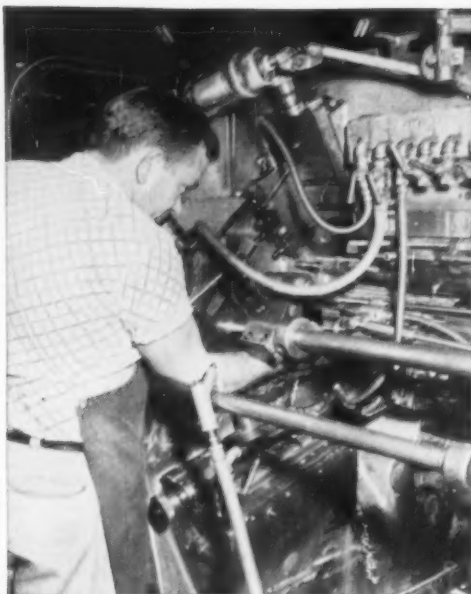
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Established 1920



WARNER & SWASEY MULTI-SPINDLE AUTOMATICS

5-SPINDLE BAR MACHINE

1 3/4" Standard Capacity

2 1/4" Oversize Capacity

5-SPINDLE CHUCKING MACHINE

8" Swing

6-SPINDLE BAR MACHINE

1 1/4" Capacity



WARNER & SWASEY AUTOMATIC CUTS SMALL LOT COSTS...

solves inventory problem for Cleco Division, Reed Roller Bit Company

Cleco Division, Houston, Texas, manufactures a wide variety of air tools. About 6000 different component parts must be machined each year—and, in order to keep reasonable inventory, in relatively small lots ranging from 100 to 1000 pieces.

While production on small hand-operated turret lathes kept inventory in line, it resulted in too high a cost per piece. On the other hand, economical production on conventional automatics required larger lot sizes and higher inventories.

In 1948, Cleco installed a Warner & Swasey 5-Spindle Automatic to solve both these problems. Its quick setup per-

mits machining small lots at automatic rates—reducing cost per piece and inventory at the same time.

This automatic has been operated on a two-shift basis—the equivalent of 16 years of one-shift production—with an exceptionally low record of downtime. Only \$144 has been spent for repair parts. And despite this usage cross slide form cuts to within .002" are easily held.

Cleco operators like the automatic's quick-set quadrants which eliminate cam changing for feed strokes, its micrometer-dial cross slide adjustment, and general ease of operation.

**YOU CAN PRODUCE IT BETTER, FASTER,
FOR LESS...WITH A WARNER & SWASEY**

**WARNER
&
SWASEY**
Cleveland
PRECISION
MACHINERY
SINCE 1880



U. S. NAVY PHOTO

Trouble Spotter...

This majestic cruiser is a U. S. Navy airship. Its mission is locating trouble—*ahead of time*. How effective its deadly purpose in convoy is attested by the fact that "no vessel escorted by a blimp in World War II was sunk by an enemy submarine." Its invaluable contribution to our Aircraft Early Warning system is also firmly established. It is a Navy "tool" that virtually eliminates surprise.

The U. S. Drill Head Co.'s new electronic device seeks trouble too—in automated production lines. It locates faulty machining during a "transfer setup" and stops the machine *before* succeeding operations are begun. It minimizes the chance of costly smash-ups and resulting expensive down-time . . . reduces re-operating and scrap-loss costs.

This development is another precision cost-reducing "tool" from the largest exclusive drill head builder in the world.

We manufacture all types of adjustable, fixed center and individual lead screw tapping heads. Ask us to help solve your multiple drilling and tapping problems.



US Individual Lead Screw Tapping Head automatically signals on a light panel exact location of any spindle not tapping to full depth, and stops the entire line. In addition, patented US Safety Tap Spindles prevent all tap breakage due to dull taps or improperly drilled holes. Installed on transfer machines, this exclusive US development provides dual automatic protection during tapping without need for an extra probing station.



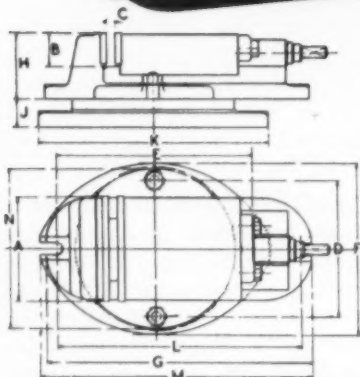
UNITED STATES DRILL HEAD CO.

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Gives you dependable accuracy!

ABWOOD PRECISION Machine Vise

... with the sliding
jaw that can't lift
and tilt the job!



- Its sliding jaw runs on "Vee" slides, is fitted with adjustment for wear and has long bearing surfaces.
- Totally enclosed hardened square thread screw can't become seized or bruised.
- Sliding jaw machined over whole surface for use of scribing block.
- Accurately machine divided swivel bases indexed fully through 360°.
- Large capacity, powerful grip, sturdy construction and high quality finish.
- No traps for swarf.
- Low height with rigidity.
- Bases drilled and reamed for insertion of tenon buttons at right angles to vise jaws.
- Crank handle supplied.

SWIVEL VISES All parts interchangeable

Size of Vise	A	B	C	E	F	H	J	K	M	Price
3"	3 $\frac{3}{16}$ "	1 $\frac{1}{8}$ "	2"	6 $\frac{1}{4}$ "	5 $\frac{3}{8}$ "	3 $\frac{1}{16}$ "	1 $\frac{1}{8}$ "	7 $\frac{1}{4}$ "	9 $\frac{1}{2}$ "	\$ 40.00
4"	4 $\frac{3}{16}$ "	1 $\frac{3}{8}$ "	2 $\frac{3}{8}$ "	8"	6 $\frac{3}{8}$ "	3 $\frac{1}{8}$ "	1 $\frac{1}{4}$ "	9 $\frac{1}{4}$ "	11 $\frac{1}{2}$ "	65.00
6 $\frac{1}{4}$ "	6 $\frac{3}{16}$ "	1 $\frac{7}{8}$ "	6 $\frac{1}{2}$ "	11 $\frac{3}{8}$ "	10 $\frac{1}{8}$ "	3 $\frac{3}{8}$ "	1 $\frac{3}{8}$ "	13 $\frac{3}{8}$ "	17 $\frac{3}{8}$ "	125.00
8"	8 $\frac{3}{16}$ "	2"	8"	13 $\frac{3}{8}$ "	12 $\frac{1}{8}$ "	3 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	15 $\frac{3}{8}$ "	22"	165.00
12"	12 $\frac{1}{4}$ "	2 $\frac{1}{2}$ "	12"		14 $\frac{1}{4}$ "	5 $\frac{1}{8}$ "	1 $\frac{7}{8}$ "	17"	24 $\frac{7}{8}$ "	275.00

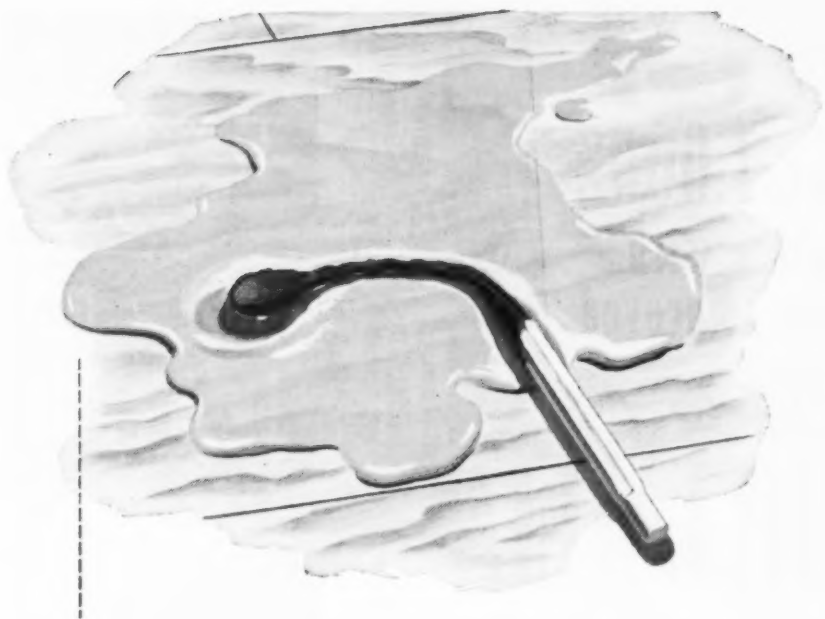
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WHEREVER a fire hazard exists near a hydraulic system, you can greatly reduce this hazard without excessive costs by specifying Shell Irus Fluid 902. This new hydraulic fluid is a "snuffer" type fluid with water dispersed in oil.

Because Irus* Fluid 902 is economical, many plant operators have found they save thousands of dollars yearly

when the changeover is made. And they obtain performance which is unsurpassed by much higher priced fire-resistant fluids.

For complete information on Shell Irus Fluid 902 write to Shell Oil Company, 50 West 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

*Trademark

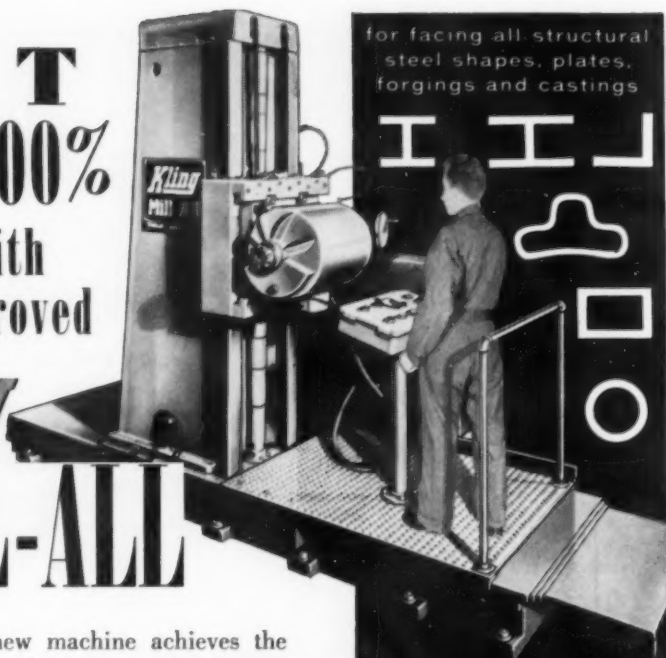
SHELL IRUS FLUID 902



CUT
up to **1,000%**
Faster with
New Improved

Kling

MILL-ALL



for facing all structural
steel shapes, plates,
forgings and castings

This versatile new machine achieves the highest production facing ever, at the lowest cost! Mill-All cuts up to 1,000% faster! It produces a finished surface that is better than most commercially-milled finishes.

The Mill-All is available in sizes to suit the largest structural fabrications, with 40 h.p. standard or 75 h.p. optional cutting capacity. Made of steel weldments with "ball bearing" feed screws. Horizontal and vertical ways covered with non-metallic facing.

Write for complete technical data contained in the new Kling Mill-All Bulletin.

Here is a tabulation of average Mill-All cutting times on structural shapes. Depth of cut is $\frac{1}{8}$ ", time is for one cut, except for plate facing where depth of cut is $\frac{1}{4}$ ".

Type of Work	Time
4"—13 lb. B. S.	6 seconds
6"—12.5 I-Beam	8 seconds
24" x 12" x 100 lb. W. F. Beam	48 seconds
8" x 8" x 1" Angle	14 seconds
24" x 36" plate, face one side	8 minutes

Since 1892

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Universal Beam and Single End Type; Combination Shear, Punch and Coper; Rolls, Angle and Plate Bending; Bulldozers.

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REX is the leader

Crucible REX® high speed steel has been the winner in shop tests for more than fifty years. *And now REX is even better than ever!* For Crucible research and experience has led to improved manufacturing techniques that mean higher quality—greater uniformity.

Prove the superiority of REX for yourself—on your next job. Check it for size, structure, response to heat treatment, all-around tool performance. Then you'll know why REX has always been the *standard by which other high speed steels are compared.*

REX is immediately available at all of Crucible's convenient warehouses—or through prompt mill delivery. For a list of available data on REX and other Crucible *special steels*, write for a free copy of the "Crucible Publication Catalog." *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE

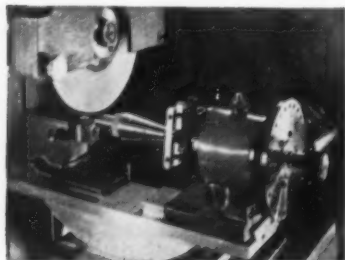
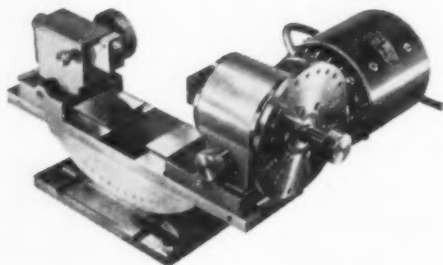
first name in special purpose steels

Crucible Steel Company of America

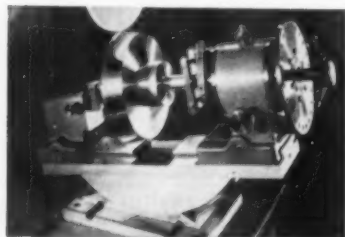
Canadian Distributor—Railway & Power Engineering Corp., Ltd.

Save on small grinding jobs with Moore Motorized Centers

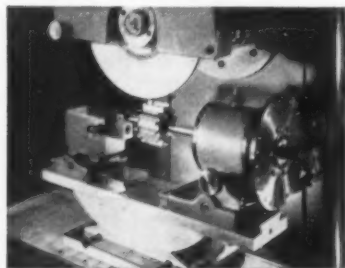
Toolroom attachment for surface grinders, jig borers, drill presses, millers, etc., handles flat, curved or circular work in one setting.



Double tapers and hex shoulder ground with a single setup.



Grinding a 10° taper on a machine part 5" long, 5" in diameter on centers.



12 equally-spaced slots in punch holder ground by using index plate.

You no longer need to tie up large machines on grinding square and round punches ... doing taper grinding, index grinding and face-plate work. Moore Motorized Centers, a portable, precision-built accessory, can be set on a surface grinder chuck in a jiffy and the job completed quicker than the grinding wheel on a large machine can be changed. You'll save on toolroom labor and materials.

With Motorized Centers, in one setting, you can grind flat, curved or circular work—in any combination of taper or contour—all within .0005". The index plate allows indexing in the same operation, too. Tapers can be reversed or changed by loosening two screws in the rocking bed, and the index plate can be engaged by merely pressing a plunger. The simple tail-stock center readily permits the use of specials—male, female or cutaway.

Catalog with 20 Action Photos shows many toolroom jobs you can handle with this versatile tool. Write for a copy today.

SPECIFICATIONS

Length—overall	12"
Width—including motor	10"
Height—overall	8"
Distance between centers—maximum	6"
Centers will swing	6"
Max. grinding angle (using 10° angle block)	30°
Motor	1/25 H.P., 115 volt, 60 cycle
Work Speeds	110-220-440 R.P.M.

Moore Special Tool Company, Inc.
728 Union Ave., Bridgeport 7, Conn.

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AVOID the
HIGH COST
and difficulty
of fabricating
long, hard
& straight parts
by conventional
methods . . .

THOMSON

60 Case

hardened and ground

SHAFTS, ROLLS, GUIDE RODS and other long-round parts

60 Case is the result of over ten years of experimental work and production experience with hardened and ground shafts which are a requirement for BALL BUSHINGS, the Linear Ball Bearing manufactured by Thomson Industries, Inc.

The special techniques and equipment that have been developed enable high production rates and low handling costs. This permits big savings over conventional methods which are plagued with erratic warpage, straightening and resultant grinding problems. Finished 60 Case parts frequently cost less than the scrap losses that result from conventional methods.

60 Case material has a surface hardness close to 60 on the Rockwell C scale which is essential to resist wear.

Long lengths of material ranging in diameter from 1/4" to 4" are stocked to enable prompt shipment of 60 Case parts, with or without special machining.

ADVANTAGES of 60 Case

- COST REDUCTION
- HARD BEARING SURFACE
- ACCURATE DIAMETERS
- GROUND FINISH
- STRAIGHT PARTS
- DELIVERY FROM STOCK
- ADDED STRENGTH
- UNIFORM HIGH QUALITY

TYPICAL 60 Case PARTS

GUIDE RODS, SHAFTING, ROLLS, TRAVERSE RAILS, PISTON RODS, ARBORS, LEADER PINS, TIE RODS, KING PINS, AXLES, CONTROL RODS, GUIDE POSTS, MANDRELS, BEARING ROLLERS, SPINDLES

Write for literature and name of your local representative.

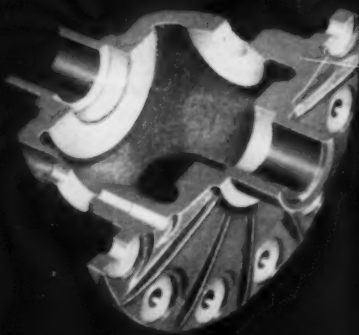
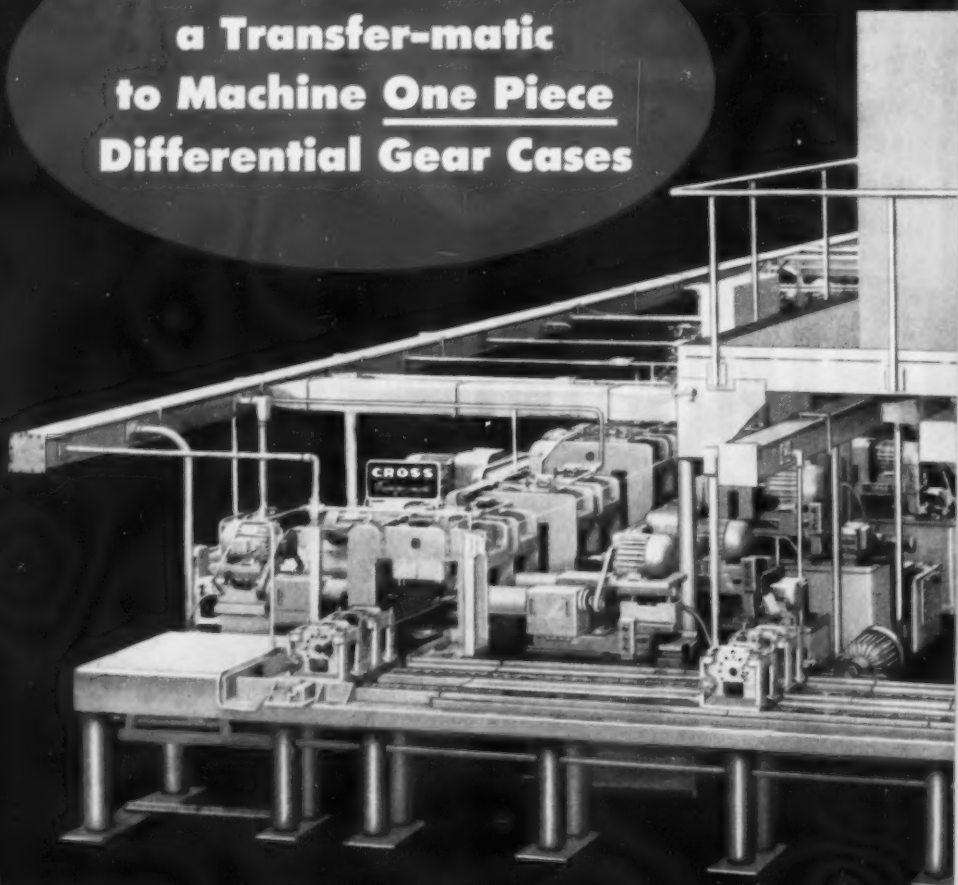
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**Another Cross First—
a Transfer-matic
to Machine One Piece
Differential Gear Cases**

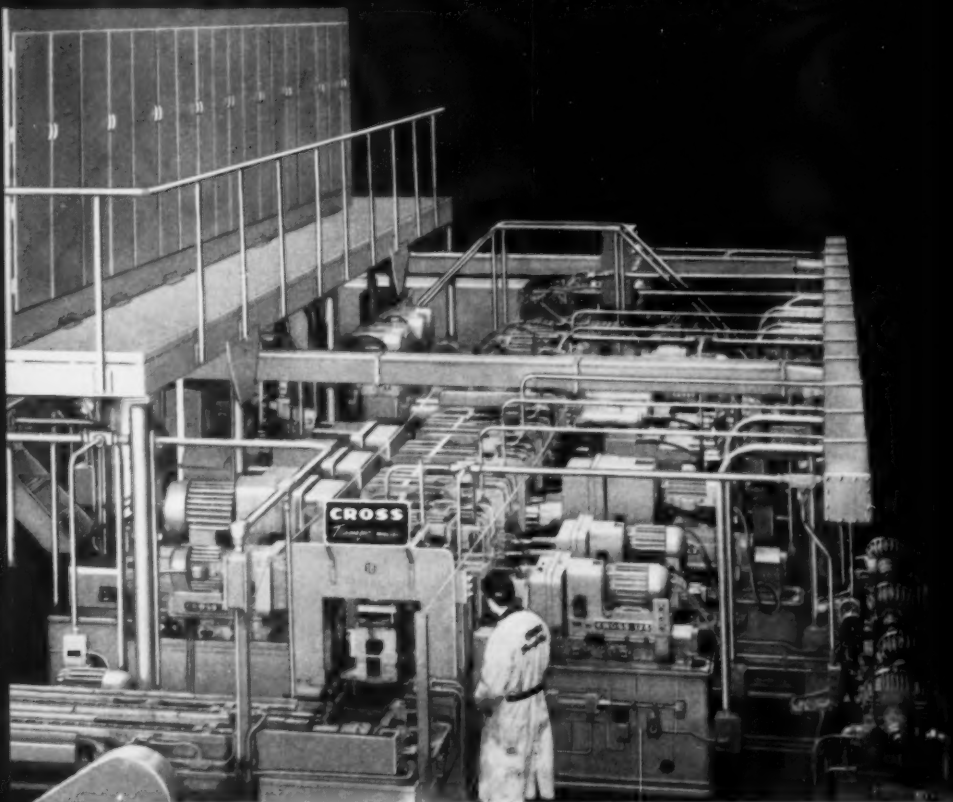


Cutaway view of differential gear case showing machined surfaces.

Established 1898

THE **CROSS** CO.
First in Automation
PARK GROVE STATION • DETROIT 5, MICHIGAN

Another Transfer-matic by Cross



Here is another revolutionary development by Cross! A new Transfer-matic makes it possible to machine and inspect one piece rear axle differential gear cases—the first time such a part has been processed on a transfer machine.

Two cases are machined at a time as they travel a distance of 206 feet through 30 stations. Rated capacity is 212 pieces per hour at 100% efficiency. Operations include rough and finish forming the two spherical seats for the pinions; rough and finish boring and facing the two seats for the side gears; drilling, boring and reaming the pinion shaft hole; drilling and reaming the lock pin hole; drilling, chamfering, spotfacing and reaming the twelve ring gear mounting holes.

A unique feature is the arrangement for locating and clamping the pallet fixtures. In each station, elevators lift the fixtures from transfer bars into engagement with locating pins and stop buttons fixed in the overhead bridge structures. Individual wedges then back up the elevators to secure the pallets. After cutting, the elevators lower the pallets onto the transfer bars, which carry them to the next station.

Other features include construction to JIC Standards, hardened and ground ways, complete interchangeability of all standard and special parts, pre-set cutting tools and Cross Machine Control Units which program tool changes to reduce machine downtime.

WHY GAMBLE WITH TAP PERFORMANCE?

You get only
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with single
tempering

and...

$\frac{3}{4}$ A TAP
with double
tempering
(industry standard)

GET
FULL VALUE
every time

WITH
SOSSNER
TAPS 



THE MARK OF
TRIPLE
TEMPERING

Hit the jackpot every time with triple tempered taps (a standard with Sossner). You'll be triply rewarded with a tougher, more reliable, longer lasting tap...less chippage...less breakage.

OTHER SOSSNER EXCLUSIVES **elektraLUBE...** A permanent Super-Lubricant

The most complete line of **SPIRAL FLUTED TAPS...**

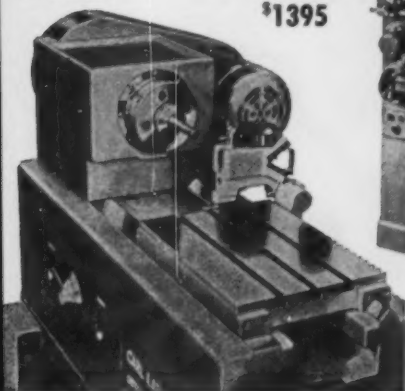
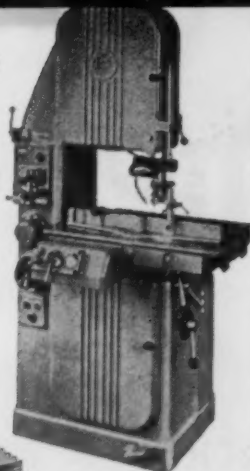
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model K-16
vertical
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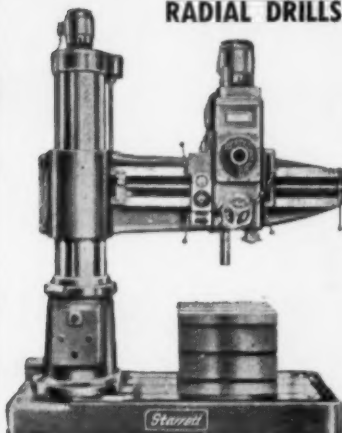
**OUTSTANDING NEW MACHINERY
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\$1.00 BUYS ANY MACHINE

Upon termination of 3 year Rental Plan

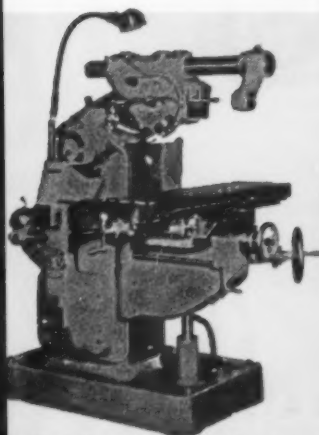
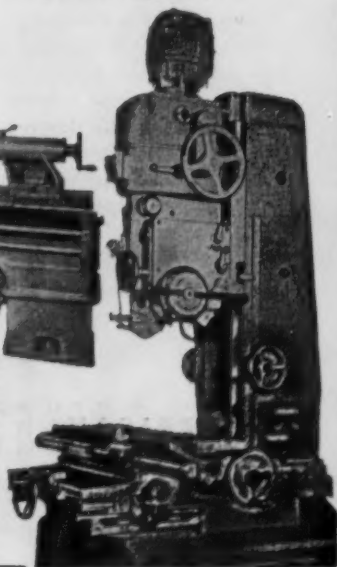
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Sizes 2½' to 6'
from \$1785. to \$6985.

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Optical Jig Borer**



ABENE vertical-horizontal
milling machine **\$3990**



BREUER-WERKE
production lathes
speeds to 1,400 rpm

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Branches: Buffalo, N. Y.; Mineola, N. Y.; Los Angeles, Calif.

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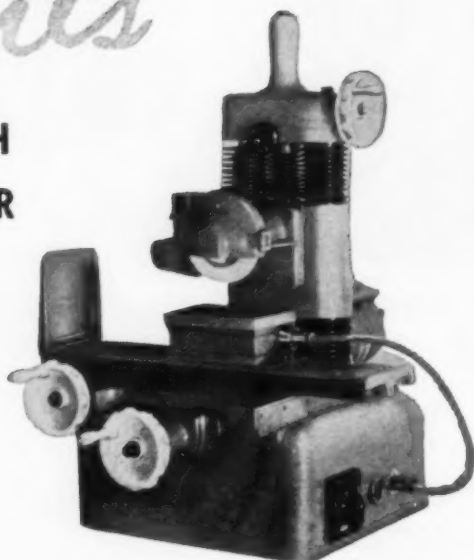
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**PRECISION BENCH
SURFACE GRINDER**

- ★ **EFFICIENT**
- ★ **ACCURATE**
- ★ **VERSATILE**

This compactly designed surface grinder is especially adapted for the precision dry grinding of small parts: dies, tools, gauges and instrument components. The low-cost LIP surface grinder permits the spot use of a number of machines strategically located throughout the plant. Features: Automatic spindle play take-up; precision ball bearings, counter balanced grinding wheel, bellows for dust protection.



Representatives note: Several Exclusive Territories Available.

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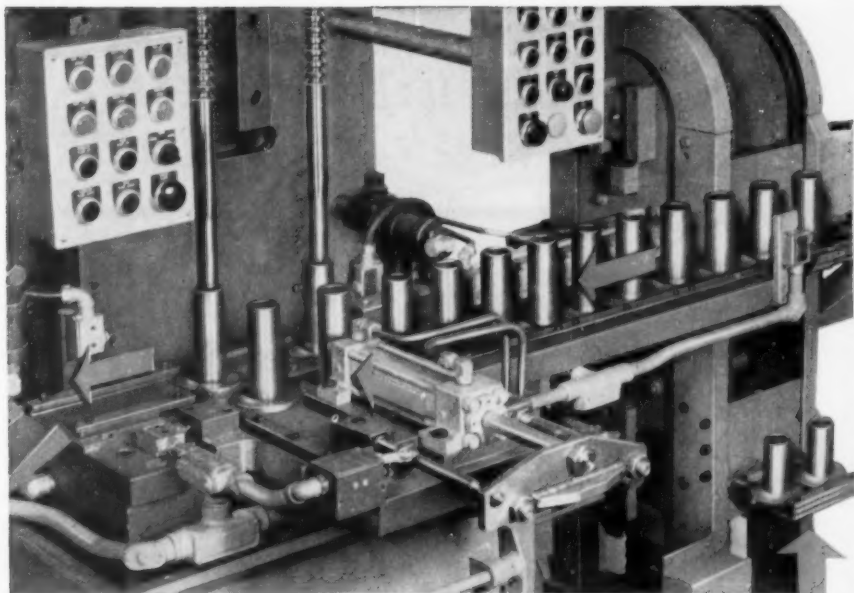
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STANDARD Broaching Machine Tooled for AUTOMATION

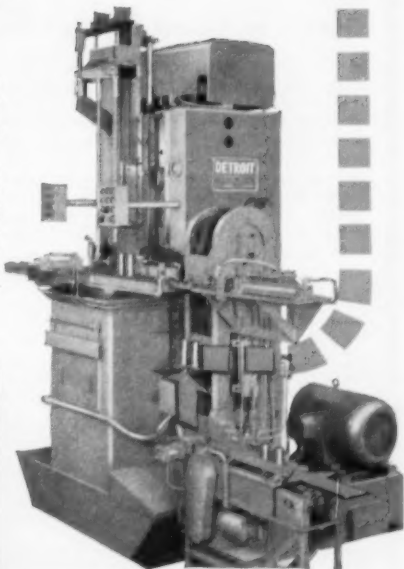
This broaching setup on a Detroit 15-ton, 42-inch Vertical Pull Down Machine illustrates *practical automation*! It combines the economy of a standard machine, readily retooled for production changes, with a special work handling system that makes floor-to-floor operation fully automatic.

Flanged work pieces are loaded at floor level, conveyed to an elevator, raised, pushed off and shuttled into broaching position, broached and unloaded . . . all without an operator. Each broaching stroke sizes the I.D. and removes excess welding at the flange joint. Parts are handled as fast as they can be supplied by the "automatics" ahead of this operation.

The same broaching specialists who created this productive combination of "standard and special" can help solve *your* production problem. Send parts, prints or details now.

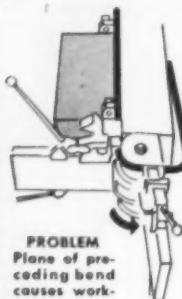
Write for bulletin describing Detroit Vertical Pull Down Machines.

**DETROIT
BROACH
& MACHINE COMPANY**
DEPT. G-5 ROCHESTER, MICHIGAN



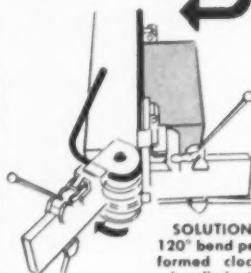
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You can eliminate problems of WORKPIECE INTERFERENCE with PINES 2-in-1 BENDER

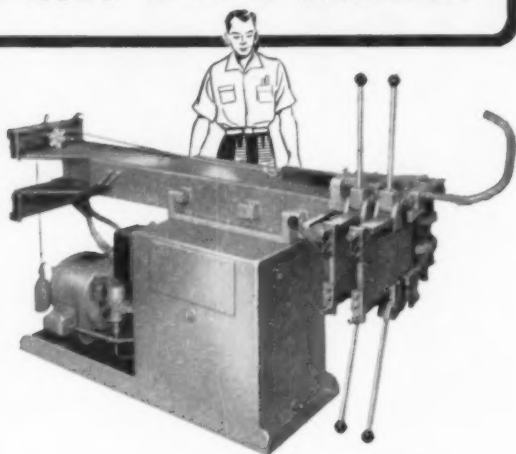


PROBLEM
Plane of preceding bend causes workpiece to strike machine.

HINGED TOP ASSEMBLY



SOLUTION
120° bend performed clockwise eliminates interference.



Pivoting Head Design Permits L.H. and R.H. Operation

● This new, small, compact Pines Bender for production, experimental, or small lot bending work is actually two machines in one. It's designed with a pivoting head and top assembly and double ways which permit fast, efficient handling of bending operation in either clockwise or counter-clockwise direction. Changeovers can be made in two minutes. You save time and reduce work handling where multiple planes and odd workpiece shapes cause interference on ordinary machines. These exclusive features permit double tooling setups, fast, accurate bending results.

300 - 400 Bends Per Hour

Typical production rates average 300 - 400 bends per hour, and the machine is powered to handle work up to 1" O.D., 16-gauge (.062") steel tubes, 3/4" bar stock, or equivalent in continuous production. Economical tooling features make it an ideal unit for tool room or experimental department work as well as for medium production.

- **DEPENDABLE HYDRAULIC OPERATION**—complete self-contained system.
- **HIGHLY VERSATILE**—will bend tubing, bars, angles, channels, extrusions.
- **ECONOMICAL TOOLING**—interchangeable for both R.H. and L.H. bends.
- **COMPACT, RUGGED**—occupies 3'6" x 8' floor space. Cast steel nose, heavy-duty bearings.
- **EASY OPERATION**—simple toggle clamping, convenient controls.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery 690 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

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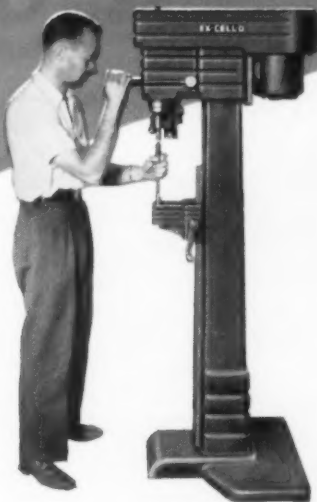


Write for complete data on this new Pines 2-in-1 machine or ask for a Pines sales engineer who will assist you with any bending problem.

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Precision Lapped Centers

Reduce Your Costs

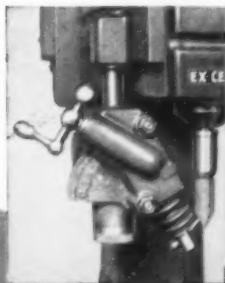


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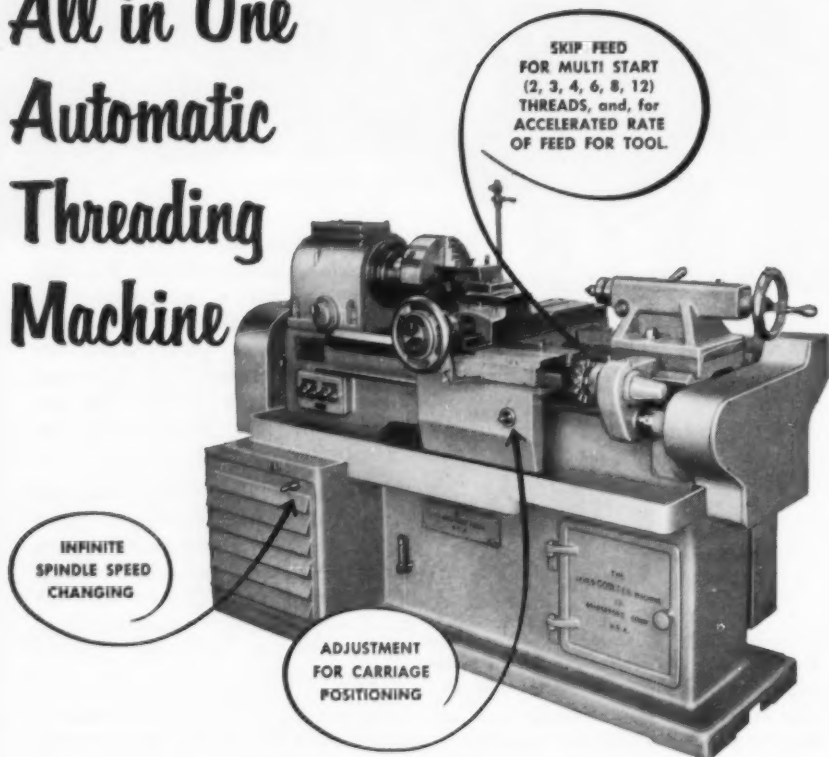
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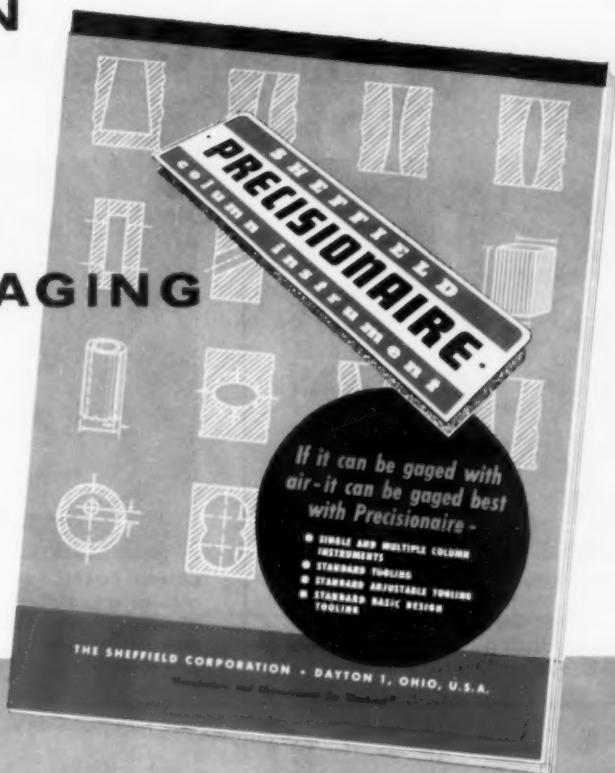
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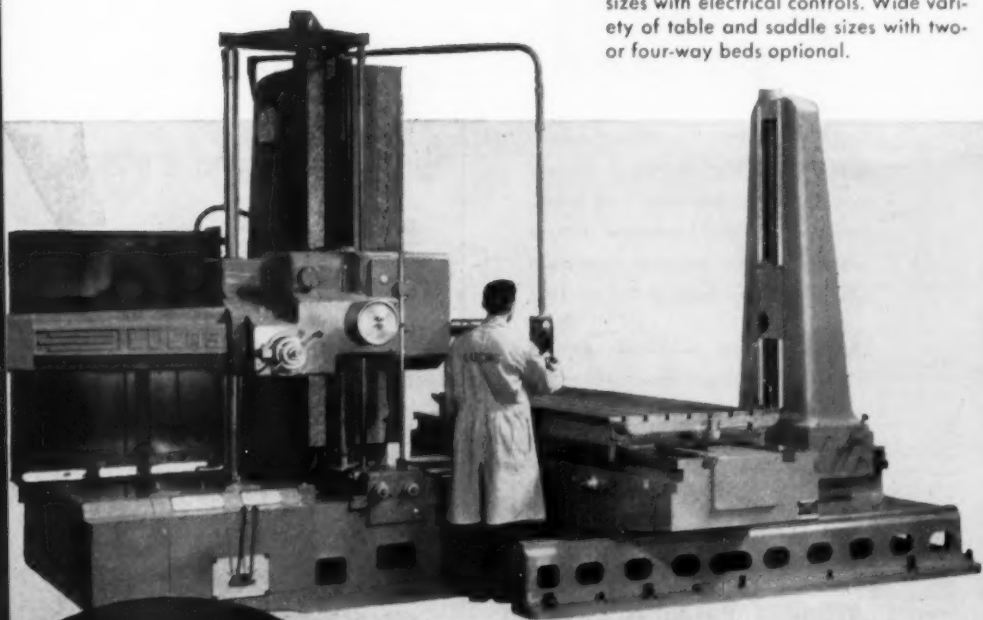
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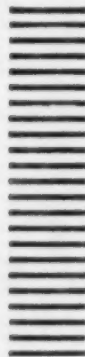
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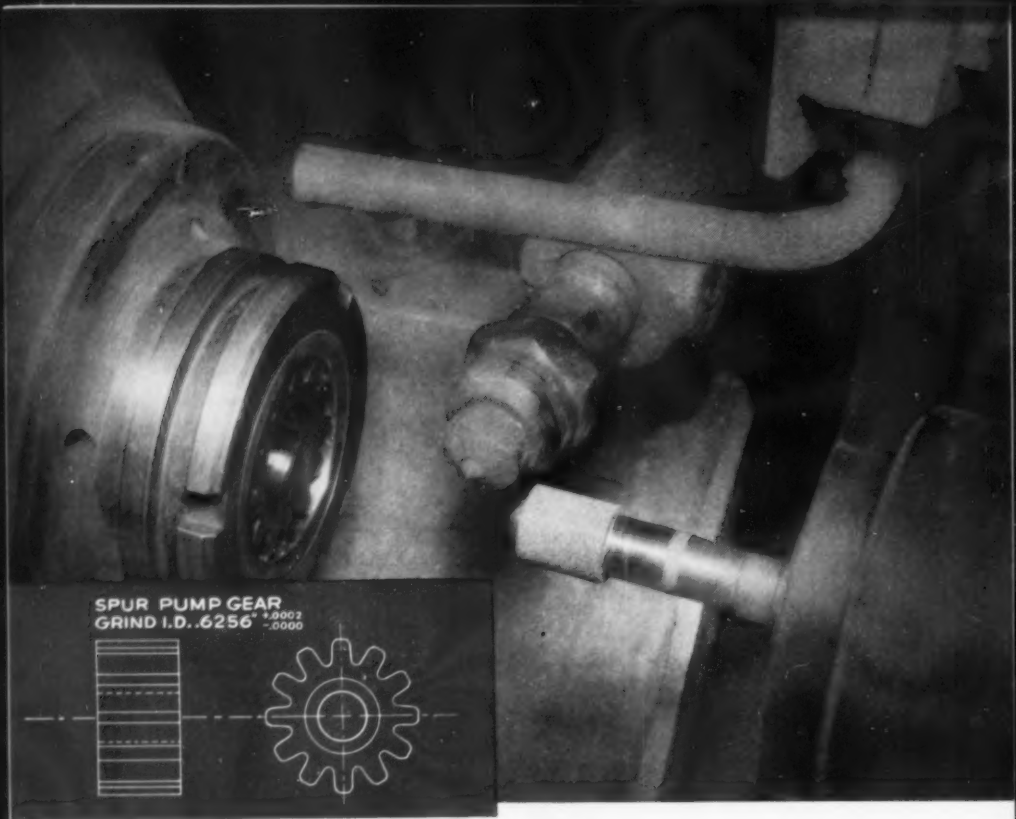
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A GRINDING PROGRESS REPORT

Extra Fine Grit Silicon Carbide Succeeds in Tough Vasco Supreme I. D. Grinding Job.

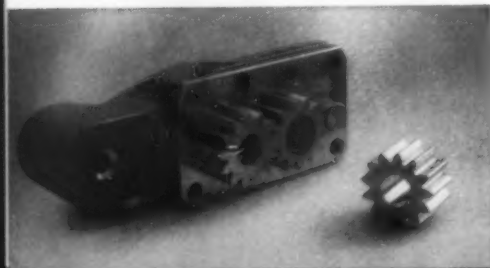
One basic fact affects wheel selection for all internal grinding: Only light infeed pressure is possible. With the wheel mounted at the end of a long, slender spindle, too much pressure would cause deflection and distort the hole. The relatively large area of grinding contact further reduces the infeed pressure. Also,

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Gear pumps made for the synthetic yarns industry by W. H. Nichols Co., require hard, abrasion-resistant steels.





W. H. Nichols Co. Foremen Rousseau and Burns, and Abrasive Engineer Pete Wilson checked closely on production, quality, and wheel performance with operator, during trials.

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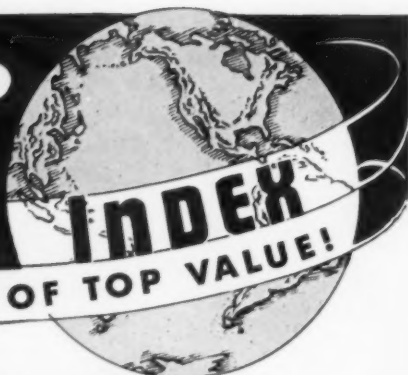


Branch Offices are located in Bristol, Conn.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.; with distributors in all principal cities.

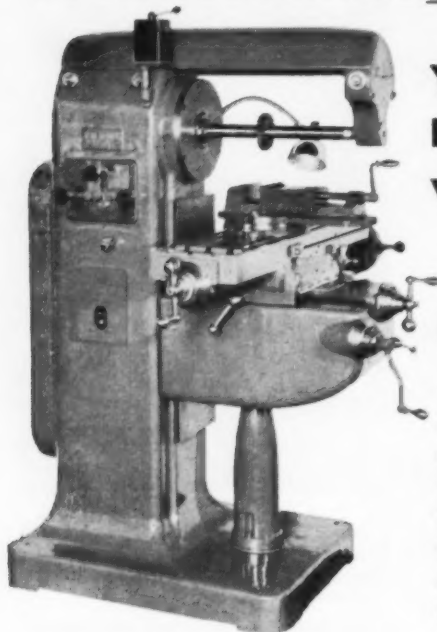
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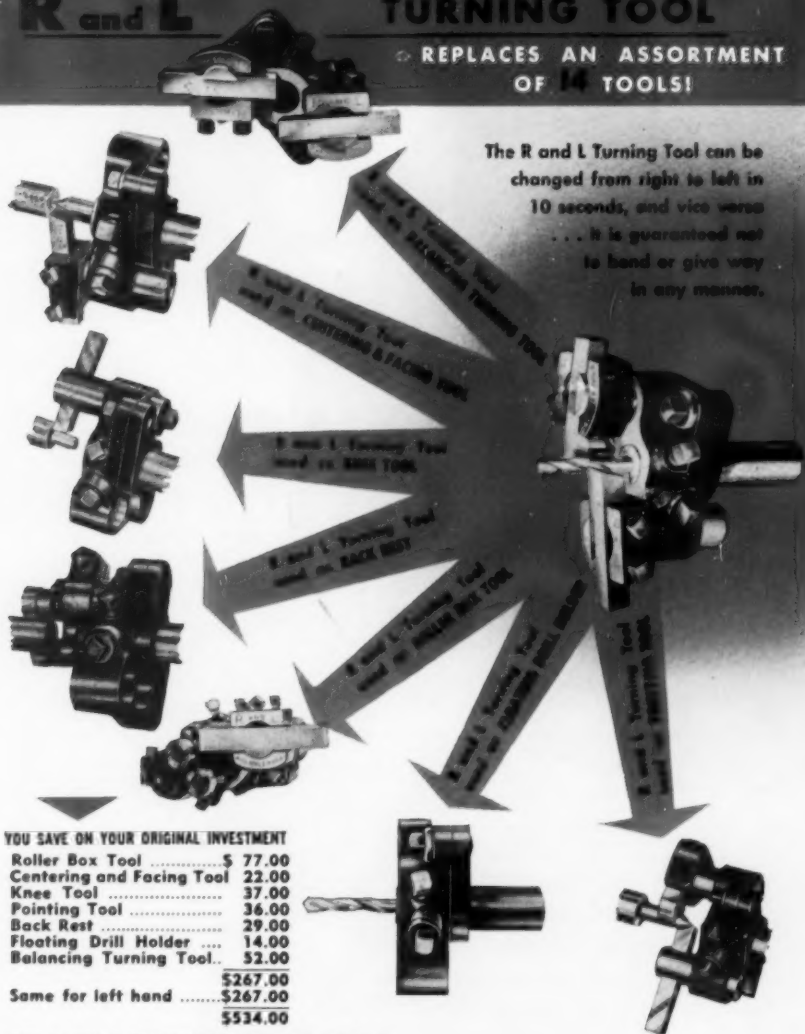
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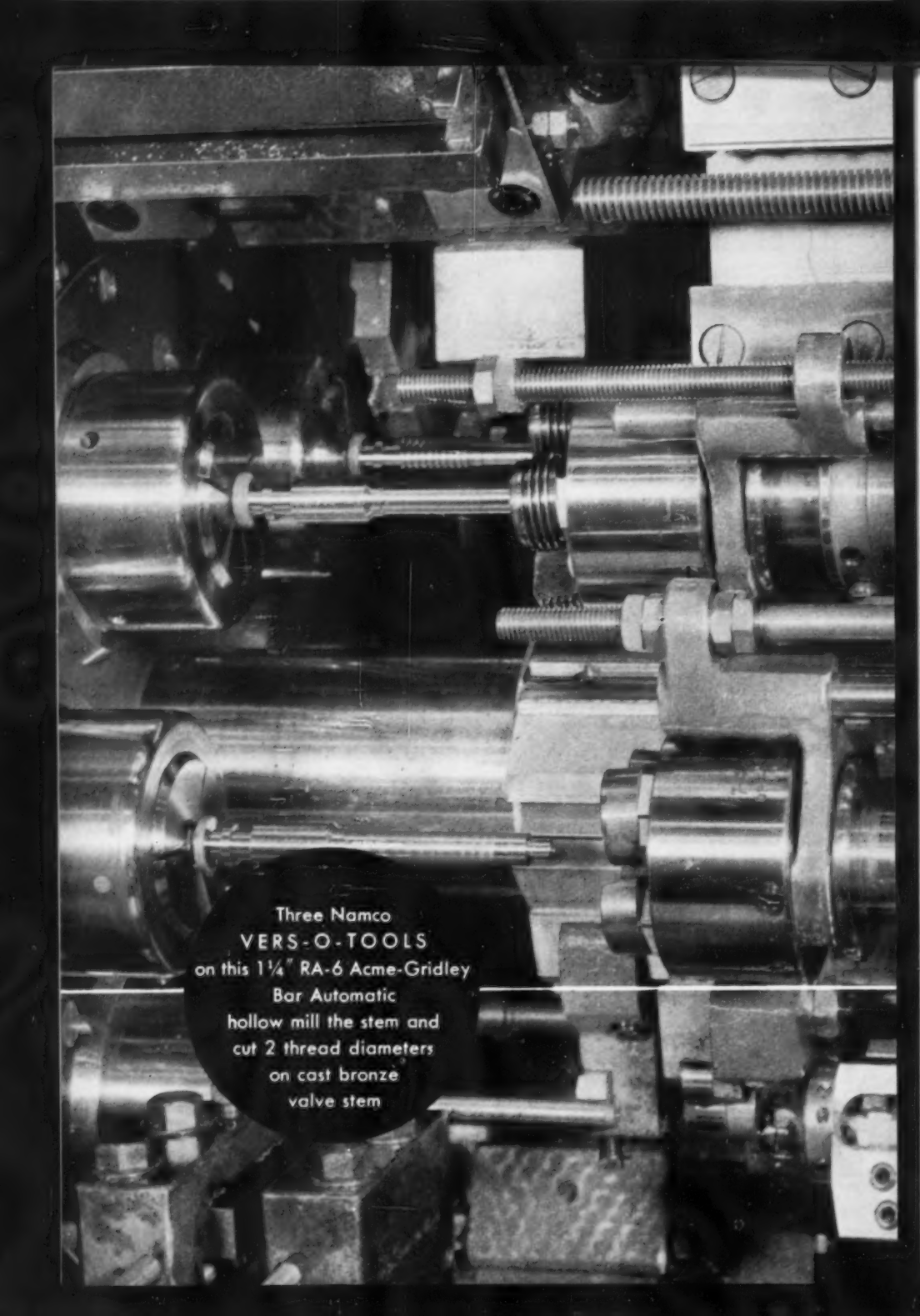
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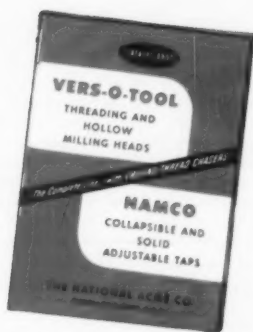
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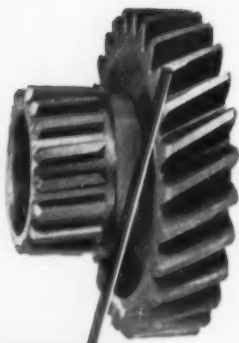
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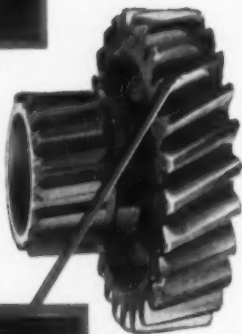
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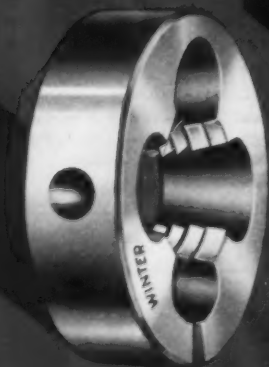
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The search that never ends

Experimental drilling of one of the hardest-to-cut materials

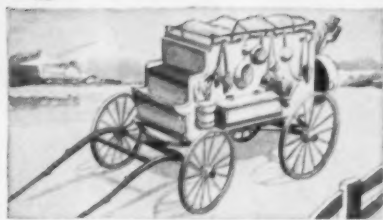
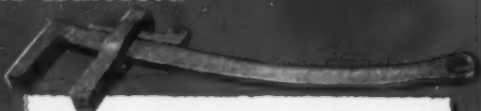


"BUY-WORD" for TOOLS for 75 years...the **WILLIAMS DISTRIBUTOR**

In Early Industrial America

An adjustable wrench, such as this 125 year old relic, was a great advance in the tools of the times. This one was picked up on the Onondaga Valley about 1870 by Horace Erdreich (a peddler).

Supplying customers with tools of the trade from his wagon or trading store, the pioneer distributor established a service essential to the growth of many industries.



TODAY, DISTRIBUTION KEYS PRODUCTION

Williams Superrenches® are typical of the functionally designed, precision-made tools in the "Broadest Line of Its Kind". To make these tools available promptly, economically and conveniently, Williams continues to work hand-in-hand with the Industrial Distributor... adding to quality products all extra advantages provided by the Distributor.

Offering prompt, personal service, local Williams Distributors save valuable time and money in ordering, production and inventory. Perhaps even more important is a service rendered which can not be bought... IDEAS. Sound, practical ideas based upon a variety of outside experiences... unbiased and beneficial.



- Reason enough, (and there are plenty more) why your best buy in tools is always through your Williams Distributor.

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MACHINE and TOOL BLUE BOOK



Loren Farris
PERSONNEL DIRECTOR
Detroit Division

Chicago Rawhide Manufacturing Co.



*"Look! It soaks up grease
just like a sponge."*

LAN-O-KLEEN removes 95% of all dirt and grime encountered in industry.

Easily — and safely!

LAN-O-KLEEN helps to protect the skin as it cleans. WEST — in pioneering the development of "double action" industrial cleaners — was the first to impregnate beneficial amounts of free lanolin into a corn meal type hand cleaner.

LAN-O-KLEEN is economical to use. It bulks greater than most other hand cleaners — therefore goes farther per pound. Too, the sturdy LAN-O-KLEEN dispenser rations just the right amount to do a quick, thorough cleansing job.

"We know of no safer hand cleaner than Lan-O-Kleen"

"We've always been interested in preventing dermatitis. This is why we've supplied our plant employees with Lan-O-Kleen for the past ten years. Its free lanolin and soft cleansing action help prevent skin irritations, yet quickly remove dirt, grease and grime," says LOREN FARRIS, Personnel Director, Detroit Division of Chicago Rawhide Manufacturing Company.

"Several of our departments have also used West Antiseptic Protective Hand Creams for a number of years. We know these aids to comfort and safety help keep our workers on the job at maximum efficiency."

Would similar results interest you? Send the coupon.

LARGEST COMPANY OF ITS KIND IN THE WORLD



WEST DISINFECTING COMPANY, 42-16 West Street, Long Island City 1, N. Y.
Branches in principal cities • In Canada: 5621-23 Casgrain Avenue, Montreal

- ☐ Please send your 24 page booklet "The Control of Dermatitis in Industry."
☐ Please have a West representative telephone for an appointment.

Name.....

Position.....

Mail this coupon with your letterhead to Dept. 21

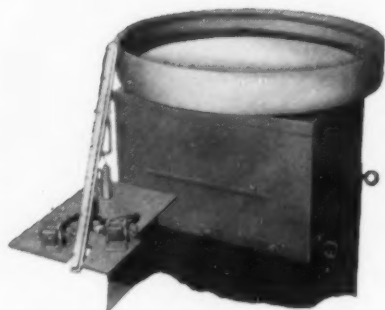
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JUST ONE *SYNTRON* VIBRATING PARTS FEEDER



**WILL DO THE
WORK OF
MANY HANDS**



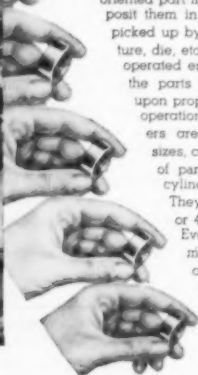
Yes—just one Syntron Vibrating Parts Feeder can take over the fatiguing, tedious, time consuming task of handling a small part, hundreds of parts per hour—and release many hands for more important work.

There are no mirrors to manipulate—nothing to hide up a sleeve. VIBRATION does the trick. 3,600 gentle, electro-magnetic vibrations per minute move the parts up and around the bowl, orienting and positioning them as they go. Thus when they reach the bowl discharge, they're positioned as you want them in your processing or assembly system.

But, that's not all. Syntron can now furnish you with Gravity Feed Tracks to transport the oriented part from the bowl discharge and deposit them in a position where they can be picked up by your work loading device, fixture, die, etc. Either solenoid or air cylinder operated escapement mechanisms release the parts from the Gravity Feed Track upon proper signal from your processing operation. Syntron Vibrating Parts Feeders are available in seven different sizes, capable of handling a size range of parts from a 1mm ball to a 12" cylinder head bolt.

They operate on 110 volt or 220 volt or 440 volt, 60 cycle a-c.

Every application that converts a monotonous manual task into an automatic operation will save you money. We can help you save money.



SYNTRON COMPANY
300 Lexington Ave. Homer City, Pa.

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catalogue data—FREE**

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MACHINE and TOOL BLUE BOOK

FORGING DIE INSERT

Material: Heppenstall 'A'
Conventional Machining

Time: 76 hours

Elox Setup & Machining

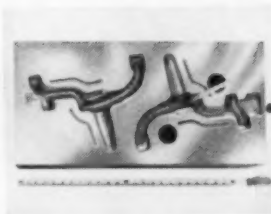
Time: 45 hours

Saved: 31 hours

Machine tool: Elox M-501 DieMatic

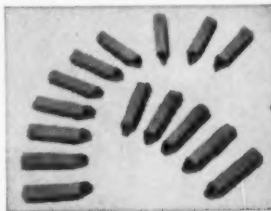
Electrode: Cast Elox-met

Customers report 50% saving on new forging dies and 75% savings in reworking dies.



TUNGSTEN CARBIDE SINGLE POINT TOOLS

E D M produces 14 identically machined tools per hour. Times include roughing and finishing, machining both faces, nose radius and top. Radius held to $\pm .001$ ". Tools were produced by 1 man operating 2 Elox Tool & Cutter Grinders, using a brass wheel. Users report Elox ground tools give greatly increased life when compared to abrasive ground tools.



EMBOSSING DIE

Material: Air Hardened Tool Steel

Die consists of 1,250 squares machined $100" \times .030"$ deep in the bottom section of the die. Sharp corners on each square had to be maintained.

Conventional Machining

Time: 227 hours

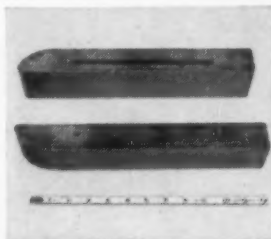
Elox Setup & Machining

Time: 10 hours

Saved: 217 hours

Machine Tool: Elox Standard M-500

Electrode: Free machining brass



EXTRUSION DIE

Material: Air Hardened Tool Steel

Conventional

Machining Time: 4 hours

Elox Setup &

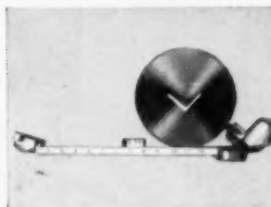
Machining Time: 1 hr. 38 min.

Saved: 2 Hrs. 22 min.

Machine Tool: Elox Standard M-500

Electrode: Free machining brass

Machining is done after final heat treating . . . eliminating the possibility of distortion.



FROM
THE
HEART
OF

EDM



... 4 jobs
that prove

Elox
puts you
ahead of
competition

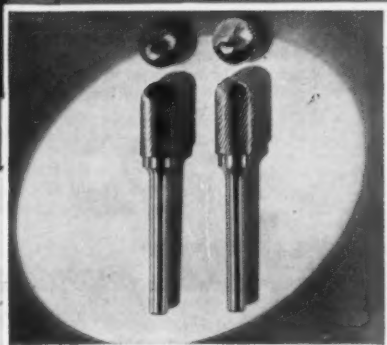
These jobs were done for Elox customers in our "Prove It" Division. There's more to them than just "man hours" saved. The Elox sales engineer in your area would like to give you all the details about these and other applications of Electrical Discharge Machining. Why not write . . .

elox corporation of michigan

1832 N. Stephenson Hwy.
Royal Oak 3, Michigan

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NOW *Carbide Burs are* **EXPENSIVE**



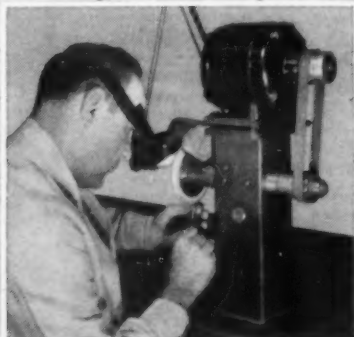
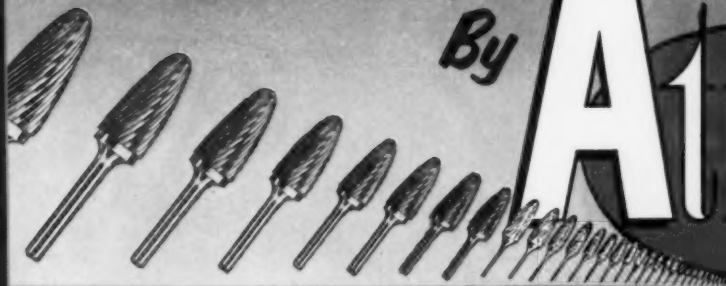
Compare the Atrax automatically-ground carbide bur (right) with the manually-ground bur (left). Note the accurate, uniform fluting, sharp cutting edges and gem-like finish of the Atrax bur.

DABLE!

Automation

By

Atrax



Manual bur grinding is obsolete. It is a tedious operation, costing much more than Atrax automatic grinding. Flute uniformity depends entirely upon the skill and patience of the operator.

For the first time in the history of metalworking, carbide burs are being produced completely automatically! The manually-ground bur, costing 10 to 20 times more than high speed steel, is obsolete. Exclusive Atrax automated grinding is many times faster than hand grinding . . . cuts time and labor costs so low that Atrax Carbide Burs are now expendable tools!

Manual bur grinding is an expensive, time-consuming operation, much less accurate than Atrax automated grinding. Atrax Automatic Bur Grinders produce precision carbide burs—eliminate human error—insure absolute uniformity of bur size, shape, concentricity and fluting. Automated bur grinding is an exclusive Atrax development—proof again that Atrax, the leader in solid carbide tooling, can save money for every user of carbide and high speed steel burs!

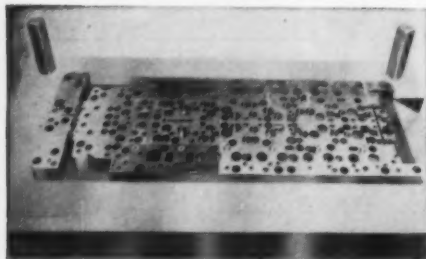
Send for the new Atrax Catalog listing more than 850 standard Carbide Burs . . . products of Automation by Atrax.



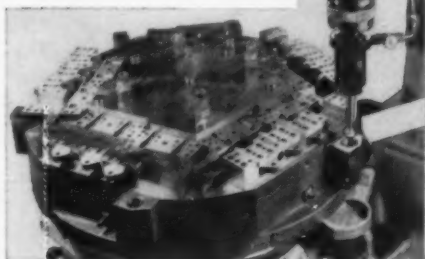
THE ATRAX COMPANY • NEWINGTON, CONN.

Holes **JIG GROUND** with *Vulcanaire*

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.



A seven station die from Vulcan's contract Tool Room. Standard sized punches and buttons were used. But since forming and piercing operations were involved hardening of the sections was necessary followed by JIG GRINDING. Result: Close tolerances held easily and perfect progression throughout — another satisfied customer.

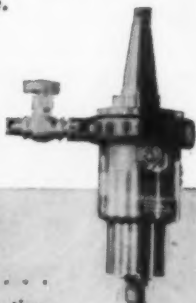


A five station indexing fixture from Vulcan's contract Tool Room. Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result — eliminated all close locating and dowelling of individual parts and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

Borrow Vulcan's 11 minute movie on jig grinding.

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Services of **YOUR TOOL ROOM** in Dayton

Engineering, Processing, Designing . . . Special Tools . . . Dies . . .
Special Machines . . . Vulcamatic Transfer Machines . . . Automation
. . . including the Vulcan Hydraulics that Form, Pierce, Assemble and
Size . . . Vulcanaire Grinding Heads* . . . Motorized Rotary Tables . . .
Plastic Tooling . . . Vulcanaire Jig Grinders.

VULCAN TOOL CO. 710 Highland Ave. DAYTON 10, OHIO



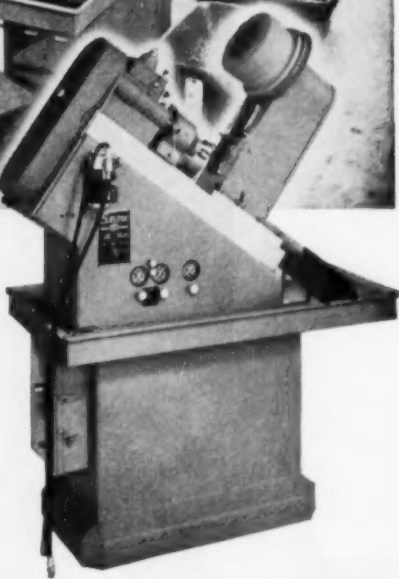
Automatic

NUT TAPPING MACHINES

This installation at *Shakeproof, Division of Illinois Tool Works, Elgin, Illinois*, is an illustration of productivity—with precision.

Simplicity of set-up and lower operational costs can make your Nut Tapping Department one of the most efficient and profitable in your plant. Submit samples and prints for a comparison with your present method.

VERTICAL DRILLING MACHINES
VERTICAL TAPPING MACHINES
VERTICAL THREADING MACHINES
TWO SPINDLE MACHINES
ANGULAR MACHINES
NUT TAPPING MACHINES
HORIZONTAL MACHINES
DRILLING AND TAPPING UNITS
AUTOMATIC JIGS AND FIXTURES
DRILL PRESS TAP HEADS



SNOW

MANUFACTURING COMPANY

435 EASTERN AVENUE, BELLWOOD, ILL.

(Suburb of Chicago)



speeds operation
and set-up on
new Rockford
hydraulic slotter

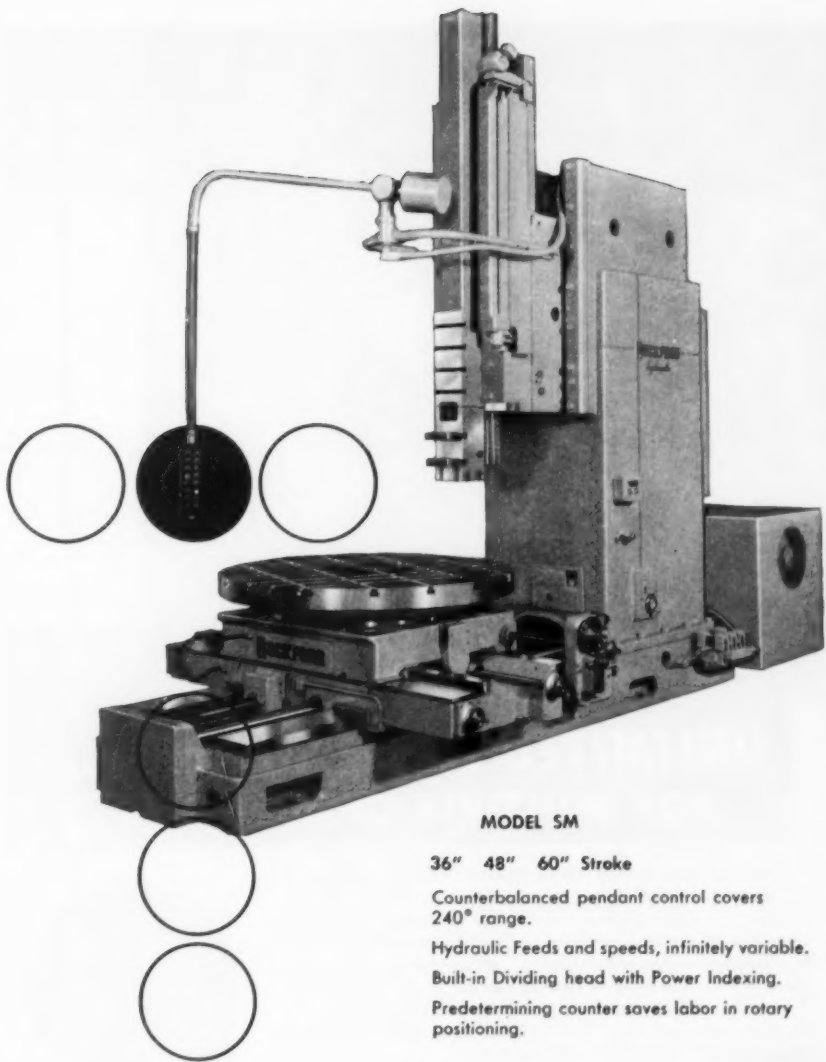
All longitudinal, transverse and rotary movements are selected and operated from the push button station of this new Rockford hydraulic Slotter.

The ram lock is pendant operated and ram stroke length and position are completely push button controlled.

Two-speed table traverse is available, enabling the machine operator to position the work to a few thousandths, without manual movements, although manual control of all movements is available from either side of the machine.

Full hydraulic drive provides two cutting ranges, one for high speeds and low cutting forces; the other for slow speeds and heavy cuts.

Get full details on this new hydraulic slotter from any Rockford Machine Tool Co. representative, or write directly to us.



MODEL 5M

36" 48" 60" Stroke

Counterbalanced pendant control covers
240° range.

Hydraulic Feeds and speeds, infinitely variable.

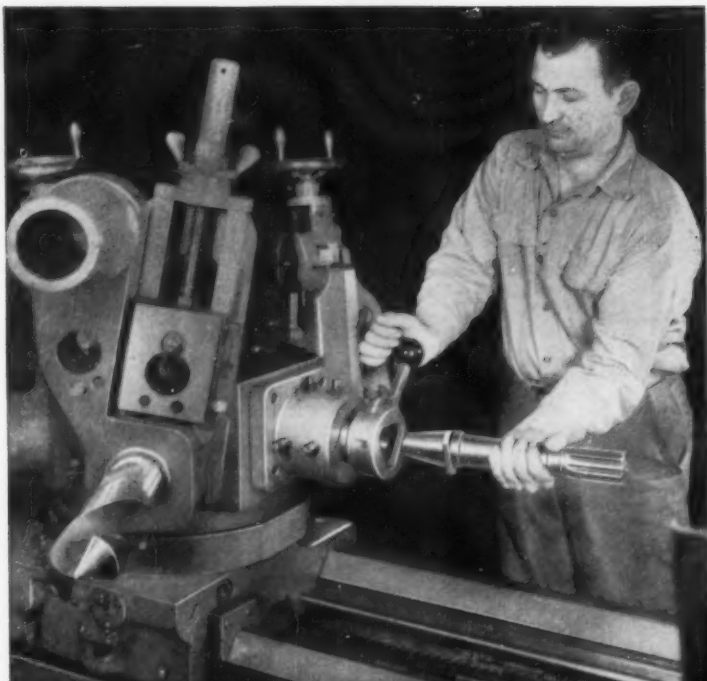
Built-in Dividing head with Power Indexing.

Predetermining counter saves labor in rotary
positioning.

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS



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UNLIMITED Turret Stations... FOR MULTIPLE OPERATIONS

A P.D.Q. (Portage Double Quick) Holder and Tool Adapter in one or more stations means an extra turret station or *unlimited* stations . . . depending on the number of operations. Just a slight turn of the lock nut releases the holder and you're set for a new tool and new operation . . . all in a matter of seconds. The new P.D.Q. method of tooling can cut costs to a fraction of former out-dated methods. Send for literature concerning complete information on THE NEWEST AND MOST MODERN TOOLING ADVANCEMENT IN INDUSTRY.



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FEATURES THIS MONTH

MACHINE AND TOOL

blue book

PRODUCTION TECHNIQUES AT VOLKSWAGENWERK. Here is a 17-page picture story of the automobile plant in West Germany. It highlights the machining methods used to produce the crankshaft, camshaft and trailing link arms of the Volkswagen automobile. Anticipated production for 1957 is over 400,000 units. This feature was written by Editorial Director William F. Schleicher, who visited the Volkswagenwerk last year.

Page 111

Interview with Heinz Nordhoff. The dynamic general director of Volkswagenwerk tells Editor Schleicher about the production problems faced in turning out the Volkswagen. Just how these problems differ from those faced in Detroit is the basis for this 5-page feature.

Page 105

Roundup of Washington News. How far will administration officials go in cutting down on foreign aid as well as the \$2.9 billion appropriation for the Labor, Health, Education and Welfare departments? This and other important events taking place in Washington are discussed in this section.

Page 95

New concept in contour machining. When work is heavy and unbalanced, such as large dies, it is easier to move the tool than to move the work. The Do-All Company's Model 5 contour sawing machine has a work capacity of 70 square feet and can take a straight cut 14½ feet long.

Page 128

Welded base for chucker provides greater rigidity, less weight and improved appearance. Demands for increased convenience of loading, tool adjustment and gauging of the work during the set-up dictated the redesign.

Page 130

How Triple Cut Planing Saves Machining Time. Heavy cuts in both directions with equal feeds, speeds and depths of cut is possible with the new Universal Planer,

product of G.A. Gray Co. The double cutting technique can be simultaneously combined with the single cutting feature to get "triple cut planing."

Page 140

Should you repair or replace your drilling machine? The author of this article, R. H. Rideout, chief engineer of the Drill Division of Buffalo Forge Co., evaluates the "when and how" to replace a drilling machine in the average size shop.

Page 145

Automatic programming. Pratt & Whitney have developed a new system of numerical control as applied to its line of jig borers, vertical hole grinders and rotary tables. Illustrations of the tape controlled vertical hole grinder in operation at Ford Motor division in Chicago are included.

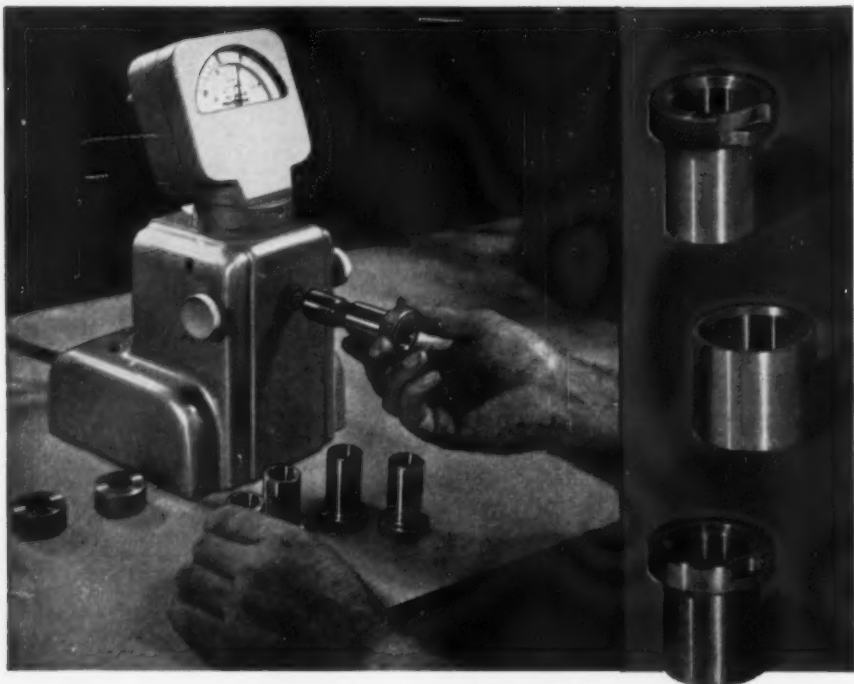
Page 151

Shop hints. Several pages are devoted to helpful hints on 1) localizing pressure while hubbing a die insert; 2) making an unloading attachment for rotary fixtures; 3) making good use of used "O" rings; 4) making a quick, accurate adjustment of the compound rest; 5) removing broken tips from blind holes; and 6) how to get longer life from end mills.

Page 165

Field reports. Equipment in action reveals to you: 1) jig brazing a fuel manifold assembly to close tolerance; 2) how a unique drill head more than doubled production; 3) new applications for chromium carbide; 4) how ceramic tools cut steel at 16,454 sfm.

Page 175



EX-CELL-O BUSHINGS LAST TWICE AS LONG

Customer's test proves there is a difference in bushings

New tests by major equipment manufacturer proved beyond doubt Ex-Cell-O Bushings last twice as long as other bushings! After drilling 16,300 holes, wear on other bushing brands averaged .0039"—ready for scrap! Wear on Ex-Cell-O Bushings averaged only .0017".

Here's why: (1) Ex-Cell-O Bushings are made of high chrome and high

carbon oil-hardening bearing steel, (2) automatic atmosphere-controlled heat treating for uniform hardness, (3) precision grinding inside and out, (4) head type bushings and liners are ground under the head for perfect seating.

Call your Ex-Cell-O Representative or write Ex-Cell-O, Detroit. You'll get same day shipment.



MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-58

Complete Mechanization— It Must Be the Logical Step

If recent statements at the Buffalo SAE meeting by two outstanding research and process development men are any criteria, management, in too many cases, has become too impressed with mechanization possibilities; so much so they fail to recognize other means of improvement. One speaker sees a need for improved methods engineering; the other told the SAEers not to be surprised to see more and more long haired mathematicians "probing into details of production methods and processes."

Dr. C. C. Furnas, who has been serving as Assistant Secretary of Defense for Research and Development, said the huge cost of installing automated equipment is rapidly reaching a point where, in many cases, it may become impractical. He predicted less frequent model changes in automobiles and appliances will result.

The other research and process development authority, G. R. Fitzgerald, formerly head of GM's Process and Development staff and now with the AC Sparkplug division, asserted that the greatest opportunity to improve labor utilization in the future does not lie in the development of new process

techniques. Rather it is the practice of modern methods engineering techniques and procedures to insure that even the smallest increments of expended effort are productive.

It is no doubt true that in many plants today well trained methods engineers and production engineers together with supervisors trained in methods engineering principles could make more improvements in labor utilization.

The special report on the Volkswagenwerk in this issue (see pages 105 to 127) points out the contrast between production techniques in West Germany and U.S. automobile plants. In West Germany, of course, the lower wage scale has some bearing on how far it is feasible to automate. Herr Nordhoff, however, points out that "complete mechanization is going forward constantly, but it takes time."

Automation or mechanization, it appears, should be the logical step in a slow evolution.

—PAUL A. MELINE
Managing Editor

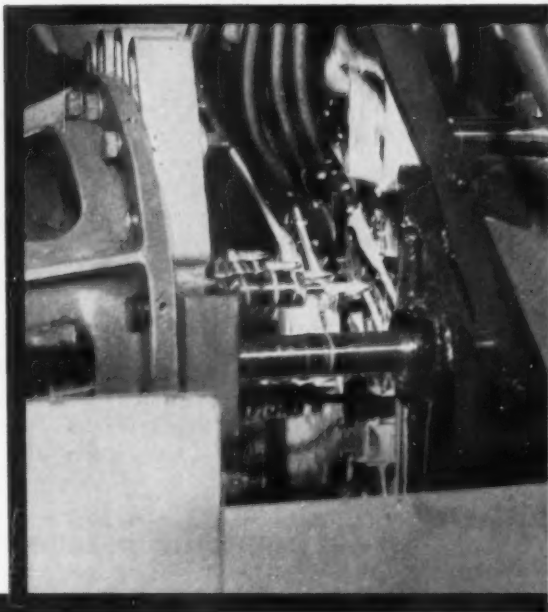


DASCO

SUPER SOLUBLE BASE

**At Outboard
Marine Corporation
of Canada Ltd.,
Peterborough, Ontario**

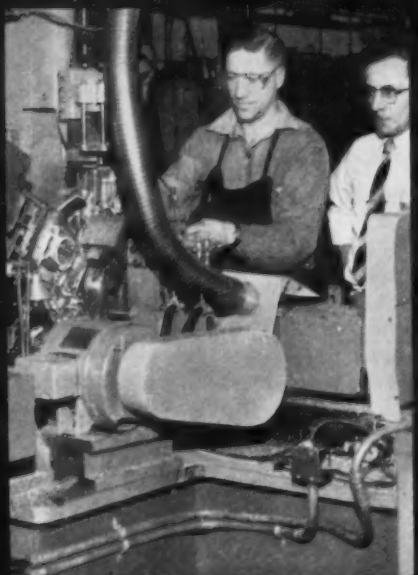
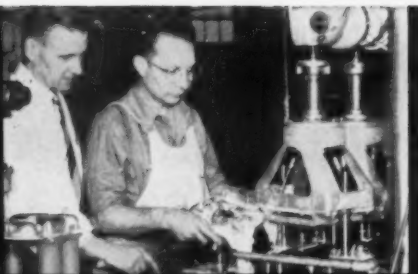
You can reduce tap breakage, cut down on scrap, and increase production the way this company did by using Stuart's Dasco Super Soluble water-mix base cutting fluid. Tap breakage and pulled threads recurring when machining aluminum alloy castings were causing high costs and slowing production in this Canadian plant. Switching to Dasco Super Soluble Base immediately ended the high scrap problem, stopped tap breakage, and reduced downtime for replacing broken tools. Accuracy and finish improved on jobs similar to the one pictured at the right, tapping aluminum alloy gas tank covers on a horizontal Magna drill.



**Fills the gap between conventional soluble oils and
straight cutting oils on difficult jobs like these**

Due to machine design and splashing problems, a straight cutting oil could not be used on these operations at Outboard Marine. Thus, a true heavy-duty soluble oil, with superior lubricating characteristics to reduce heat generation, was the best answer to trouble-free machining.

Dasco Super Soluble has a sulpho-chlorinated fatty oil base which lubricates the cutting edge and aids chip formation... improves performance on heavy-duty jobs too tough for conventional soluble oils—jobs such as cold-nose boring of steel shells... threading and turning B-1113 steel rod... and round-hole broaching. If your operations are too tough for ordinary "coolants," call your Stuart sales engineer for a test sample of Dasco Super Soluble Base.



Nine 32 pitch screw threads are tapped in a single setup in aluminum alloy silencers for Outboard Marine's 35 hp outboard motors at 100 per hour. A relatively rich mixture of 12 parts water to one part Dasco Super Soluble Base is used.

ENDS TOOL BREAKAGE AND HIGH SCRAP LOSSES

This was the job (left) that really proved the effectiveness of Stuart's Dasco Super Soluble Base, applied in a fine spray blanketing the entire work area. It's a special-purpose machine, designed by Outboard Marine engineers. In a single setup, it bores a hole in the piece, inserts a bushing, turns and faces both ends, taps seven holes, and drills six oil holes. Production rate is 38 finished pieces per hour with a tolerance of plus or minus .0005 in. on the bored diameter. Formerly, shutdowns to replace either broken drills or taps really put a crimp in production, but since the change-over in cutting fluids, the machine has performed in outstanding, trouble-free fashion.



Phone your
Stuart Service Center

Arrange now to test Stuart's Dasco Super Soluble Base on your difficult cutting and grinding jobs.

DETROIT, MICH.....Tyler 7-8500
CHICAGO, ILL.....Bishop 7-7100
HARTFORD, CONN.....Jackson 7-1144
CLEVELAND, OHIO.....Prospect 1-7411
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Whatever your carbide drill requirements may be... whether solid carbide or carbide tipped... it always pays to make sure you use an "ACE". Their "ground-from-the-solid", highly polished flutes have keener, stronger cutting edges. And that means finer accuracy, longer tool life, and lower drilling costs for you!

Call your local Ace Drill Distributor today!



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ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

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MEETINGS CONVENTIONS EXHIBITIONS

Apr. 30-May 1—Metal Powder Association
1957 Metal Powder Show, Drake Hotel,
Chicago, Ill. Association headquarters: 130
W. 42nd St., New York 36, N.Y.

**May 1-3—American Institute of Electrical En-
gineers** North Eastern District (No. 1)
meeting, Pittsfield, Mass.

**May 1-3—1957 Electronic Components Sym-
posium**, sponsored by American Institute of
Electrical Engineers, Institute of Radio En-
gineers, Radio-Electronics-Television Manu-
facturers Assn. and West Coast Electronic
Manufacturers Assn. Morrison Hotel, Chi-
cago, Ill. Symposium headquarters: J. S.
Powers, Electronic Components Symposium,
84 E. Randolph St., Chicago 1, Ill.

**May 7-9—American Institute of Electrical En-
gineers** East Central District (No. 11) meet-
ing, Dayton, Ohio.

May 9-10—Illinois Institute of Technology
sponsored "Managerial Controls Confer-
ence" IIT Metallurgical and Chemical En-
gineering Bldg., 10 W. 33rd St., Chicago, Ill.
Address: Conference Director H. Raymond
Swanson, 3300 Federal St., Chicago 16, Ill.

**May 14-16—Industrial Nuclear Technology
Conference**, Museum of Science and In-
dustry, Chicago. Address: Dr. Leonard Reif-
el, Armour Research Foundation, 10 W.
35th St., Chicago 16, Ill.

May 16-18—Engineering Industries Exposition
sponsored by New York Society of Profes-
sional Engineers, Statler Hotel, New York,
N.Y.

May 20-23—Design Engineering Show, New York Coliseum. Machine Design Division of ASME meets concurrently with the show.

May 21-22—Fabricating Machinery Hydraulic Conference, sponsored by Vickers, Inc., Sheraton Cadillac Hotel, Detroit, Mich.

June 11-13—Western Plant Maintenance and Engineering Show, Civic Auditorium, San Francisco, Calif. Headquarters: 759 Monadnock Bldg., San Francisco 5, Calif.

June 24-28—American Institute of Electrical Engineers Summer General Meeting, Montreal, Que., Canada.

July 20-Aug. 2—National Machine Tool Builders Association annual sales conference, Cornell University, Ithaca, N.Y.

Aug. 28-30—American Institute of Electrical Engineers Pacific general meeting, Chinook Hotel, Yakima, Wash.

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**FOR MORE EFFICIENT
DUST COLLECTION
—FILTERS LAST LONGER**

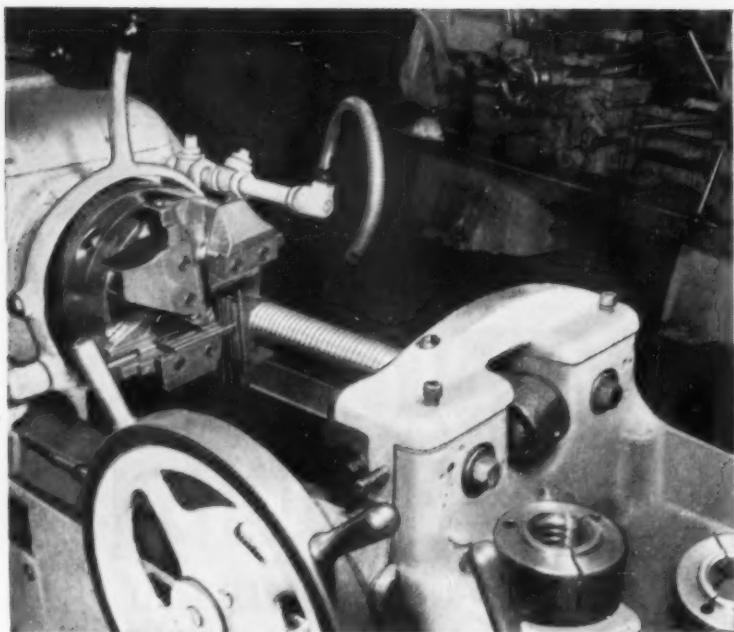


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coarse threads cut in ONE pass with

LANDMACO MACHINES

LANDMACO Machines offer both precision and heavy duty threading, as illustrated in the production of adjusting screws at the Iowa Manufacturing Co. of Cedar Rapids, Iowa.

Using 1045 steel forgings, $2\frac{1}{4}$ "-3 pitch Special Acme threads (EXTRA DEEP) are cut 10" long, with a .026 pitch diameter tolerance and a .001 per inch allowable lead error. 12.5 pieces are completed per hour, cutting at a speed of 7.6 surface feet per minute, including 100% gaging on the machine with go-and-no-go gages. Despite the large amount of metal removal, at least 80 pieces are produced between chaser grinds.

LANDMACO Machines are available for threading all diameters from #4 to 4"—ask for Bulletin H-76 and Special Report on Cutting Acme Threads.

463

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ROUND-UP OF WASHINGTON NEWS

MACHINE AND TOOL

blue book

Production Outlook. Most experts label the production picture, "spotty." Lately there has been a trend toward moderate curtailment, reducing inventories at wholesale and retail levels. In some lines, further inventory liquidation may be indicated, delaying the usual spring pickup in production. Economists say that a sharp upturn in consumer demand would cause many retailers to be short of merchandise. At the end of the first quarter of 1957, business had slipped very little from the record heights set during the closing months of last year.

Cutting the '58 Budget

Although, at this writing, the drive to cut the President's budget seems to be slowing down, Administration officials say they have agreed on how and where to cut foreign-aid spending. The amount is as yet undisclosed, but they claim to have found spots to cut, both in goods on order and goods scheduled to be ordered soon. Capitol Hill leaders favor reducing by \$1 billion the President's requests for \$4.4 billion foreign aid appropriations. The President, however, is trying to prevent any deep slash in foreign aid funds, believing that national interests require rather generous spending, and that failure of U.S. foreign policy could result from drastic economizing now at the expense of foreign aid programs.

Postmaster General Summerfield

has asked the Senate to put back the \$58 million the House earlier cut from postal appropriations, thereby restoring his agency's \$3.2 billion budget for the fiscal year starting July 1.

The House is voting reductions in most sections of the huge \$2.9 billion appropriation bill for the Labor, Health, Education, and Welfare Departments.

Tax Cuts?

Two top Administration money managers, Treasury Undersecretary Burgess and Budget Director Brundage, are stirring hopes of a cut in taxes for 1958. They believe sizable tax reductions will be justified then. Both men base their expectations on the current economy drive.

Tax relief for small business may

soon be recommended by President Eisenhower. Pending legislation might cost Uncle Sam \$100 million a year in revenues. The plan would not contain any broad tax cuts for these companies, but would involve such provisions as depreciation of used equipment, estate taxes and tax losses by investors in small businesses.

Anti-Racket Laws

Senate investigators studying the problem of misuse of funds belonging to labor unions will recommend legislation to prevent future abuses. Union chiefs agree that some anti-racket laws are desirable, but fear such legislation may go beyond the immediate purpose of constraining errant union officials and may impose unnecessary shackles on organized labor.

No one is looking forward to the job of writing a new anti-racketeering chapter into the labor laws; it

will be difficult to keep from stepping on the inflamed corns liberally sprinkled over union leaders' toes.

Army to Buy 900 Medium Tanks

The Department of the Army has announced plans to purchase an additional 900 medium tanks in the immediate future for approximately \$100,000,000. Contract negotiations for procurement of these tanks are now under way with all prospective producers. The medium tank is at present being manufactured by the American Locomotive Company at Schenectady, N.Y.

Political Sniping

President Eisenhower has felt the barbs of personal criticism to a greater degree in his second administration than he did in his first. This type of attack has not been unusual in previous administrations,

"Much as we hate taxes, the goal of a just peace is an objective that over-rides our aversion to high taxes—if taxes are needed."

President Eisenhower

"The lawmakers can't determine which of the Federal employees covered by the \$1 billion-a-month payroll are essential and which are non-essential. The Administration should promptly launch a cost-consciousness campaign. Every agency head should be held to strict accountability for his monthly spending, and the word 'economy' should be kept constantly before him."

Senate Majority Leader Johnson (D., Texas)



**You wouldn't
cut out paper dolls
with a hedge clipper!!**

**Then why shear 6-inch wide material
with a 10-foot shear?**

Cutting a small piece of light metal, plastic or rubber on a big shear is even more expensive than it is exasperating. Yet many shops, out of necessity, tie up big shears with small work.

That problem is solved by the New Lodge & Shipley 24" Speed Shear. Specially designed for fast cutting of small pieces, it has a capacity of $\frac{1}{8}$ " x 24" mild steel. Its unique work table is provided with holes which allow fast set-up of guides, templates and protractors for production of straight-side blanks at speeds up to 120 strokes per minute.

For detailed Bulletin No. PS-12, Write:
**The Lodge & Shipley Co., 3074 Colerain Ave.,
Cincinnati 25, Ohio**



Lodge & Shipley

but Mr. Eisenhower escaped it almost entirely during his first term of office.

Some of his friends have urged him to engage television time and bring his problems to the people. His controversial budget, his views on foreign policy—such questions as these would receive a sympathetic hearing by the people as a whole, it is believed. They have rallied to his support in the past; they might very well do so again.

That Broad National Inquiry Into Our Financial System

Many basic issues are involved which will make the broad national inquiry into our financial system somewhat controversial.

The inquiry, recommended by President Eisenhower in his State of the Union message, is going to require considerable monetary soul-searching, both inside and outside of Congress, before all the issues are resolved.

Boom conditions, such as have prevailed in the past 18 months or more, create serious problems of inflation control. On the one hand,

can the general price level be held in check without creating some unemployment in some sectors of the economy, while in other sectors, prices continue to advance? On the other hand will labor costs continue to rise because the labor organizations continue to impose their demands on employers?

The commercial banking system has become a smaller sector of our financial apparatus. Financial developments outside of the commercial banking system, such as the building and loan associations, consumer credit financial institutions, private insurance, pension funds, and the fact that the U.S. government has been making and guaranteeing loans on a broad basis makes FED policies less pervasive and with less control over the credit and monetary situation as a whole.

Certain Congressmen are demanding immediate investigation on the credit allocation setup. This is in regard to the alleged unfairness in credit restraint as it has applied to large borrowers on the one hand and small business, residential construction plans, school boards and municipalities on the other.

Inflation or Deflation? Which is the greater threat? The consumer price index rose 3.5 percent, from 114.6 to 118.7, during 1956. The wholesale price index rose 4.09 percent, from 112.4 to 117.

Since December, however, major components of the wholesale price index have gone down. Raw materials have declined 5 percent, on the average, since Dec. 1.



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Socket screw users who want *what* they want *when* they want it know it pays to specify B-RIGHT-ON! Brighton Socket Screw Products *always* measure up.

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Write for descriptive literature . . . see how

**YOU CAN DO BETTER WITH
B-RIGHT-ON.**

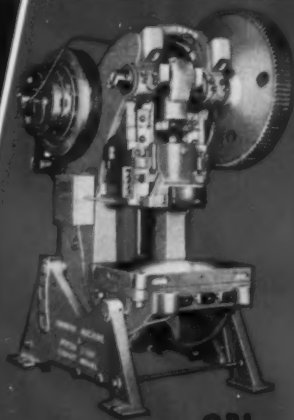
**THE BRIGHTON SCREW
& MANUFACTURING CO.**

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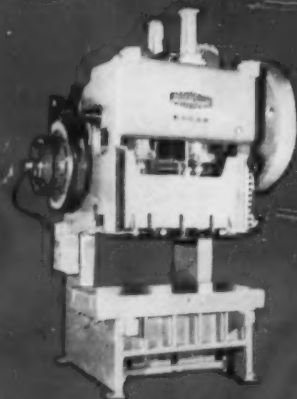
Customers tell us they get
MORE for their money...
 that's why they buy these

3 JOHNSON PRESSES



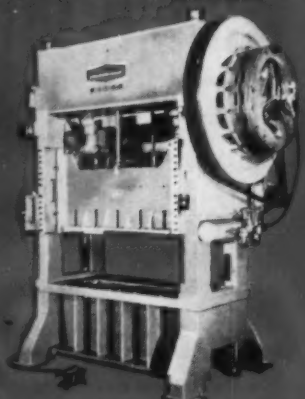
OBI

23 Models ranging from 16 to 150 ton capacity in regular, special wide or high speed types—pin or air clutch.



GAP DOUBLE-CRANK

40-100-125 and 150 ton capacities, steel fabricated, air clutch, flywheel or geared models.



STRAIGHT SIDE DOUBLE-CRANK

40-60-80-100-125 and 150 ton capacities.

Tie rod, steel construction and air clutch.

Write for Bulletin 1956

Johnson

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 and PRESS CORP.**

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LETTERS TO THE EDITOR

MACHINE AND TOOL

blue book

The editorial of March, 1957, "Better ceramics on way; in the meantime . . ." by Paul Meline, pleasantly offers assurance that I am in the employ of a forward-looking organization. Back in December, 1955, our Plant appropriated funds and instituted a ceramic testing program.

Generally, our findings correspond with those determined by Boeing, Ford, and General Motors. Our interest in ceramics continues unabated for two reasons:

1. Its non-alloying quality which resists tool build-up and permits excellent finishes at high velocity speeds.
2. Its competitive influence upon the Carbide Industry which already has resulted in improved grades of cutting materials.

Would you please mail another copy of the March, 1957, issue of MACHINE and TOOL BLUE BOOK for my own files.

S. H. Mittleman
Tool Coordinator
The National Supply Company
Torrance, California

Progress Reports of Ceramic Tools

As one of your many steady readers I have read your articles on Ceramic Tools with keen interest.

We are in the Rubber Industry and, as is the case with all companies, we are on the constant look-out for ways of improving our methods.

I would like to experiment with this tooling but cannot find any Supplier in the New York area who carries the material.

Would you please give me the names of the Suppliers in the New York area who carry these tools. If you are unable to supply the above, please give me the names of the manufacturers.

Thanks in advance for any help or

information that you might be able to give me.

JOSEPH MASHECK
PLANT SUPERINTENDENT
IDEAL ROLLER &
MANUFACTURING COMPANY
Long Island City, New York

List of suppliers forwarded.

. . . I have been requested by our Time Study Department to obtain six tear sheets each of "Better Ceramics on way; in the meantime . . .," Page 129, and "Possibilities of Ceramic Tools," Page 145, and "Incentives"—Page 162. These articles appeared in your March, 1957 issue.

When the supervisor requested the

material he enthusiastically referred to the articles as the best he has seen.

STANLEY J. PANEK,
ADVERTISING MANAGER,
LAKE ERIE MACHINERY CORP.
Buffalo, New York

... Would you please tell us who made the Ceramics "A" used in tests in your Progress Report No. 1 in the March issue of MACHINE and TOOL BLUE BOOK? Also, who manufactured the tools considered best in Report No. 2 and Report No. 3?

We have been using some Stupalox ceramics on test and find it to be considerably better than carbide on the same application. We would like to take advantage of others' research as to the best brand available at this time.

WALLACE E. WEBER
WEBCO MIAMI, INC.,
Miami, Florida

Information sent to reader.

Response from Editorial Mention

So many times a job well done is taken for granted . . . however, I would like to thank you for the excellent results that we have had from the editorial that you ran about us in the March, 1956, issue of the MACHINE and TOOL BLUE BOOK.

We are still receiving inquiries from this editorial.

FRANKLIN K. CARNEY
SALES MANAGER
HURON MACHINE PRODUCTS, INC.
Dearborn, Michigan

Reprints Requested

Would you please send reprints of the following articles which were published in the January, 1957, edition of BLUE BOOK:

1. Discharge Machining by T. Iantelli.
2. "Bouncing Ball" Method of Inspection by A. R. Felando.

I also want to take this opportunity to tell you how much I enjoy your publication.

RALPH SCHEY,
PLANT MANAGER,
CLEVITE HARRIS PRODUCTS, INC.
Napoleon, Ohio

... Thank you for sending us the four reprints of the articles dealing with Ceramic Tooling.

Mr. Scott, director of our Training Program, feels that this information is of great value to our Library.

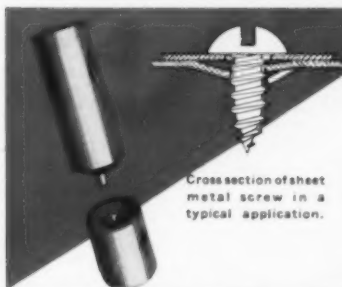
MRS. ZETA L. PERSON,
LIBRARIAN
THE HEALD MACHINE COMPANY
Worcester, Mass.

... Your pamphlet "Solve Measurement, Control, Speed Problems by Using Small Mechanical Differentials," reprinted from issue dated January 1949, is a wealth of information.

I would greatly appreciate an additional copy.

A. R. MOORE, JR.,
DEVELOPMENT DESIGNER,
AERODYNAMICS
LABORATORY OPERATION
Philadelphia, Pa.

Now! FOR EVERY TYPE OF FASTENER... R-B Punches and Die Buttons



Cross section of sheet metal screw in a typical application.

THREAD-HOLE FORMING ...

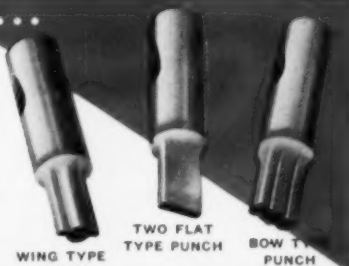
Cuts Assembly Time and Material Costs

With each stroke of the press, R-B Thread-Hole forming punches pierce a hole, lance a radial slit, and form surrounding metal into a spiral cone that conforms to the pitch of your sheet metal screw thread. By producing these formed-thread-holes directly in the sheet metal you eliminate the need for using nuts, washers, tap strips, etc. R-B formed-holes provide greater holding power against vibration, contraction, etc. R-B Thread-Hole Forming Punches and Die Buttons are carried in stock in several sizes.

FOR SIMMONS TYPE FASTENERS ...

R-B Piercing Assures Low-Cost Holes

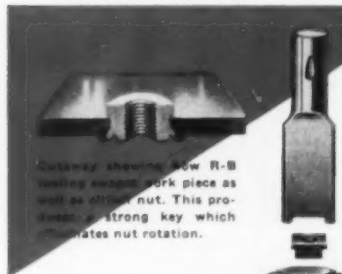
R-B manufactures a line of standard punches and die buttons that rapidly pierce exactly the type of holes required for Simmons spring-lock fasteners. Punches and die buttons have the standard R-B ball-lock feature which prevents vertical and radial movement in the retainer—assures accurate alignment without additional keying—permits quick insertion and removal. Carried in stock, these standardized punches and die buttons can be used in any conventional press.



WING TYPE PUNCH

TWO FLAT TYPE PUNCH

BOW TYPE PUNCH



Cutaway showing how R-B tooling works: work piece as well as clinch nut. This produces a strong key which insures nut rotation.

Punch holds nut magnetically. Nut pierces hole and is clinched underneath by the die button.



R-B CLINCH NUT TOOLING ...

Will Tighten Your Fastening Costs

R-B Clinch Nut Tooling permits you to insert and clinch one or more nuts with each stroke of the press—no extra clinching or welding is necessary. Also, the same die can pierce, form or blank your product. R-B furnishes standardized punches, die buttons, hoppers and flexible feed chutes for any size or shape Clinch Nuts.

Special R-B Punches and Die Buttons

R-B will design and manufacture special punches and die buttons that will economically pierce holes for any type of fastener—Use R-B Engineering Service For Your Piercing Problems.



RICHARD BROTHERS PUNCH DIVISION

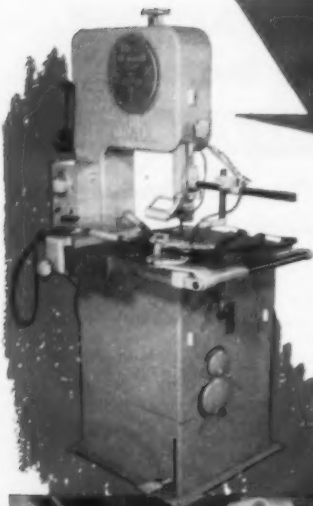
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Our production problems are different

An interview with
Prof. Dr.-Ing. Heinz Nordhoff,
Volkswagenwerk, W. Germany



Q. *What, briefly, are the differences in production methods between the Volkswagenwerk and Detroit?*

A. The American automobile is basically of a different construction from the Volkswagen and consequently fabricating methods must be different. The crankcase, transmission housing, and housing for the rear axle bearings are all made of magnesium. They are much lighter than the American counter-

parts and much easier to machine. The torsion bar spring is also different. The body is so worked that not one soldered seam results. But above all, it is the very high cutting speeds, which result in entirely different relationships for us than for American factories. In general the smaller motors, in contrast to U. S. motors, must carry finer tolerances. To this must be added the peculiarities inherent in air-cooled motors and in our transmission.

Nordhoff of Volkswagenwerk

continued

Daily production: 1500 passenger cars, 340 transporters

Q. I saw very few transfer lines. Why is this?

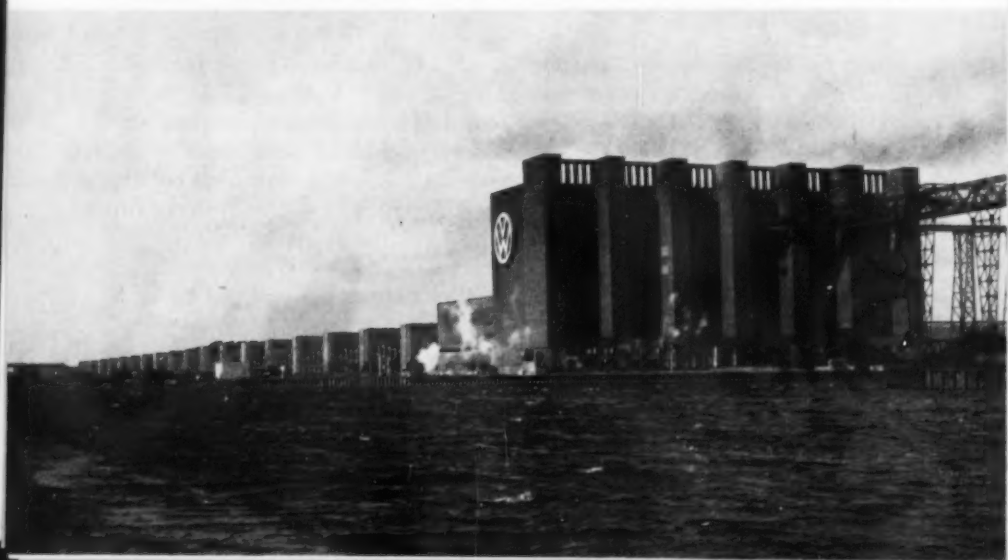
A. In America transfer machines were first used for the larger motor components (housings) etc. These are exactly the parts, as previously mentioned, which require short machining times for us. Therefore the necessity did not exist for us to acquire transfer-type of equipment. For all other parts with few operations we employ special machines with rotary tables from which we

obtain a very favorable piece per hour rate.

In our body plant we have partial automation and we are in the process of developing this further.

Even in the direction of partial automation we have done quite a bit, such as: loading and unloading by means of magazines, automatic sizing and inspection and numerous control devices. This entire area, which we are following with the greatest interest, has a different meaning for us than for the U. S.

VOLKSWAGEN PLANT IN WOLFSBURG on Mittelland Canal is main manufacturing and assembly plant.





BODY PRESSES with automatic transfer of stampings at Wolfsburg plant.

because our wages are lower, although the proportion of wages to other costs are similar to those in the U. S.*

Q. Do you import such special machines as you buy?

A. There are splendid special ma-

*Ed. Note: This may be better understood when the cost of automatic equipment is related to the wage scale. In the U.S. the high wage scale makes the cost of automatic equipment worthwhile. In Germany, because of the lower wage scale, the relation of the cost of automatic equipment to wages is such that cost reductions do not appear in the same dramatic light as in the U.S.

chine tool builders in Germany which have been found ideally suited for mass production techniques. Only in a few instances do we need to turn outside of Germany—primarily America—for special machines.

Q. The above questions were prompted by my having seen many manual operations which in America are performed by machines, or by attachments which reduce manual operations considerably.

A. Those manual operations you saw will be, if economically advantageous, taken over by machines. Since we started at the end of the war with nothing, we have not yet completed all the things

Nordhoff of Volkswagenwerk

continued

we have in mind. Complete mechanization is going forward constantly, but it takes time.

Q. I saw very little clerical help on the floor and seemingly no paperwork.

A. The counting and testing of finished parts takes place at the inspection end of each production line. At this station all paper work is accomplished. One of our big

aims is to keep all paper work and similar clerical operations away from the production lines; our efforts to be systematic is not limited to production machines.

Q. Are your workers under an incentive system?

A. Our workers are paid on the basis of group piece work; we have no premium system. One group encompasses usually several produc-

Volkswagenwerk transporter production plant at



tion lines; for instance: motor group, transmission, front axle, etc.

The group piece work is estimated according to a classification which is dependent upon the valuation of the work.

Q. What is your wage scale?

A. The wage scale is dependent only upon ability and not education or background. The average wage of the production worker is approximately DM 2.50 per hour; the skilled labor wage in the non-production capacities (Machine builders) about DM 2.75 per hour. Maxi-

mum wages are about DM 3.50 per hour. The purchasing power of a D-Mark is about 60 cents.

Q. What is your present output of Volkswagens?

A. Our daily production is now 1500 passenger cars and 340 transporters. To this must be added 5 per cent for replacement parts.

Methods to increase production are continually being introduced. One important development has been the new Hanover plant for producing the transporters. (See below). ● ● ●

Hanover occupies an area of 120,000 square meters

The Volkswagenwerk has erected a new VW-transporter production plant at Hanover. This makes a separation possible between production of VW passenger cars and transporters which long since has been thought practical for technical reasons.

After careful consideration General Manager Prof. Dr. H. C. Nordhoff decided on Hanover for the new plant after approximately 235 communities of Western Germany had competed for it. Decisive were the economic factors: Hanover is situated near the VW-parent factory at Wolfsburg; it offers good transport facilities for the incoming raw materials as well as for the assembled cars. The location of Hanover and its relation to the export harbors is of special importance.

In the Hanover plant about 4,400 persons are employed who were previously working in the Transporter Assembly Department of Wolfsburg.

Modern work places have been provided with every possible device to ease their work. All the technical equipment as well as the handling and operation methods have been predesigned by the VW planning engineers and combined into an organic unity.

The erection of the Hanover plant—on an area of about 120,000 square meters—was carried out in 9 million working hours. Approximately 2.4 million bags of cement, 22,950 tons of structural steel and 8¼ million bricks were used. Nearly 1.3 million cu. meters of soil had to be moved, i.e. 256,000 truck loads of 5 cubic meters each.

Of the numerous technical innovations installed at Hanover, two are outstanding: the automatic body priming equipment and the largely mechanized assembly line. This makes the plant one of the most modern and finest automobile factories of the world.

If you machine parts like these...

we can save you UP TO 30%

...with Ryerson leaded steels

If you machine carbon or alloy steels for production or maintenance applications—you should be able to make substantial savings by switching from a standard steel to a Ryerson *lead*ed steel.

We can tell you about customers who produce up to 50% more parts per machine hour, now that they have changed over to a leaded steel recommended by Ryerson. Others report tool life lengthened as much as 300%... rejects reduced to all-time lows... machine down-time slashed... finishing processes eliminated.

The nation's largest stocks of leaded steels in a wide range of types and sizes are ready for quick shipment from Ryerson. (See listing below.) Each is the fastest machining steel of its type available anywhere. If you are not now using leaded steels, it will be worth your while to investigate the possibility of adapting one of them, or several, to your operations.

A Ryerson representative will be glad to work with you. Show you dozens of case histories—good hard facts that document just how well Ryerson leaded steels have worked out under actual shop operating conditions. Call your nearby Ryerson plant.

LEADED STEELS IN STOCK

CARBON STEEL BARS

Ledloy (Screw Steel)... Cold drawn rounds, squares, hexagons.

Rycase (Case Hardening, Low Carbon, Manganese)... Cold finished rounds.

ALLOY STEEL BARS

Rycut 20 (Low Carbon, Case Hardening)... Hot rolled and cold finished rounds.

Rycut 40 (Medium Carbon)... Hot rolled and cold finished rounds, annealed to heat treated and stress relieved.

Rycut 47 (Medium Carbon)... Hot rolled, annealed rounds.

New Rycut 50 (Medium Carbon)... Hot rolled and cold finished rounds in annealed condition, hot rolled rounds heat treated and stress relieved.

Leaded 8620... Rounds, hot rolled, cold finished.

Leaded 4140... Rounds, cold finished, annealed or heat treated and stress relieved.

Leaded 8647... Rounds, hot rolled, annealed.

CARBON STEEL PLATES

New E-Z-Cut Plates (Hot rolled, low carbon, manganese.)

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MACHINE and TOOL BLUE BOOK



Production Techniques at Volkswagenwerk in West Germany

By **William F. Schleicher**
Vice president and Editorial Director

● The following photo-caption story is presented to BLUE BOOK readers with but one thought in mind: to present pictorially and quickly a few of the manufacturing operations performed at the Volkswagenwerk in West Germany. Limitations of space naturally preclude a more detailed discussion and we are mindful of the paucity of the material.

It was of some debate in the editorial department whether it were more desirable to describe one production line in minute detail or discuss more than one line in random fashion. The latter was decided upon. We believe a picture

story of here-and-there operations possesses greater interest. Furthermore, it is possible through this type of presentation to portray the "feel" of the Volkswagenwerk and their production facilities.

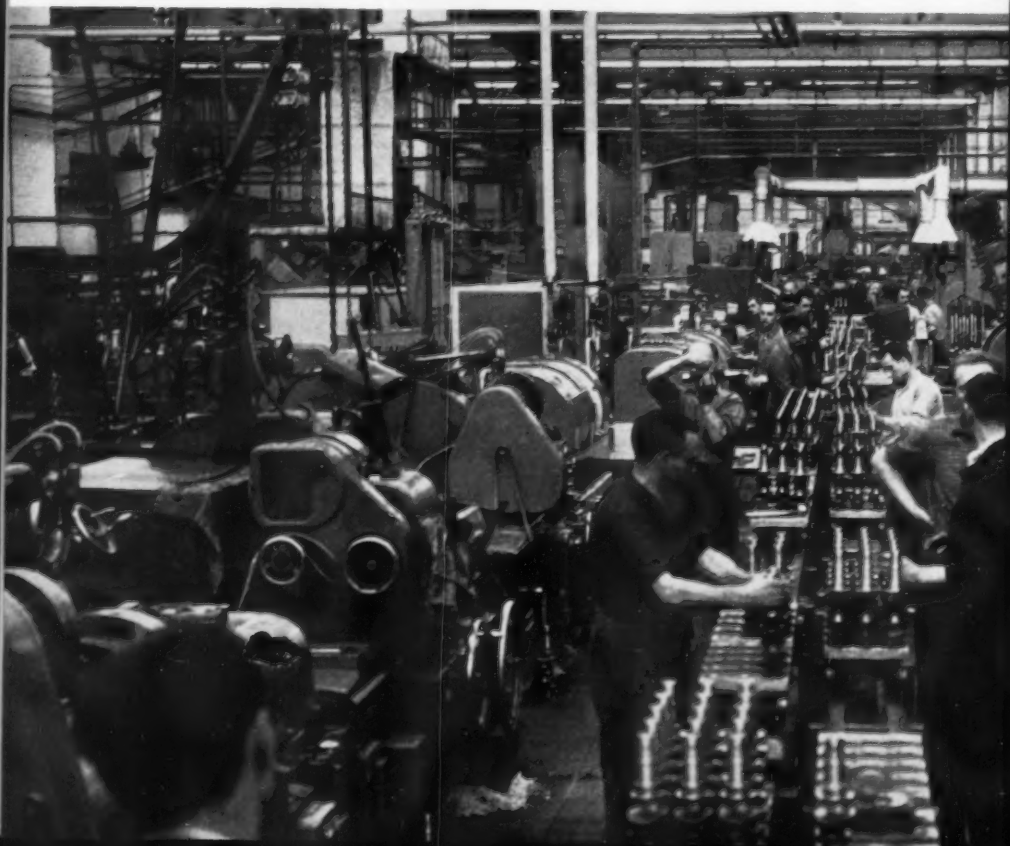
No effort was made to select unusual or bizarre operations. Such operations would present a distorted picture of the production facilities and methods. No effort was made to select operations which would not clearly represent the facilities.

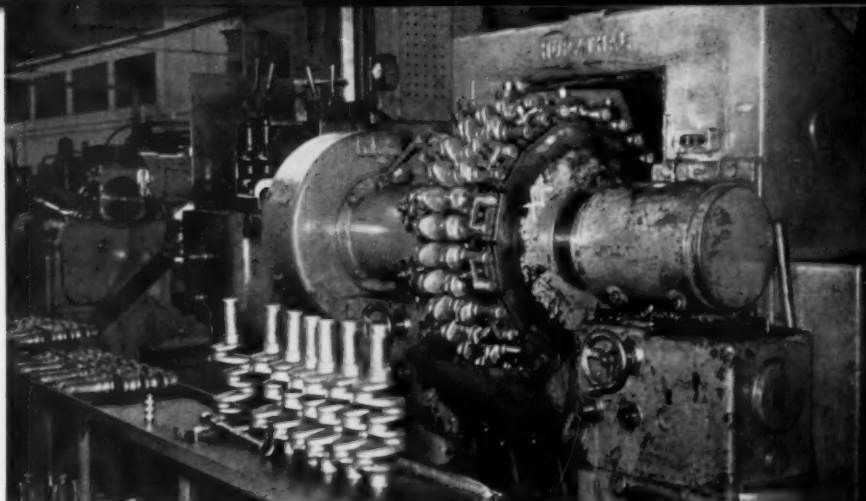
Starting on the next page is a short picture story of how the Volkswagen is made.

Highlights of the

Crankshaft Line at Volkswagenwerk

The plant is well lighted and well ventilated.

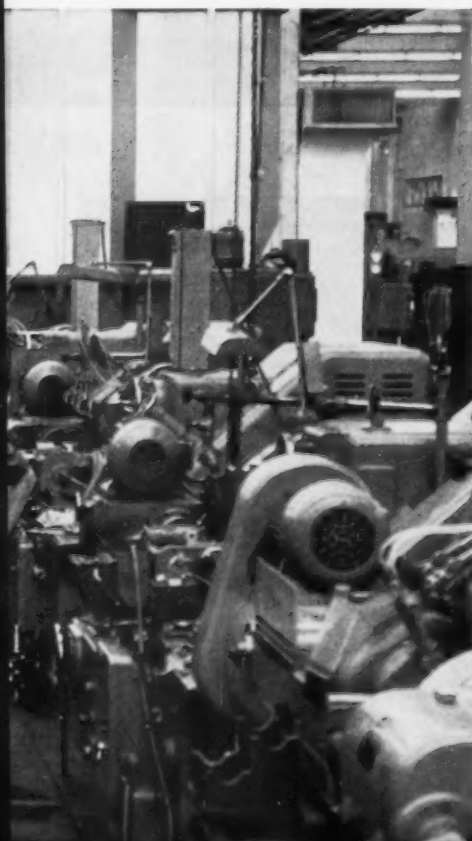




Housekeeping is excellent.

Both ends of crankshaft are milled simultaneously . . .

On this rotary milling machine both ends of the crankshaft are milled simultaneously. Loading is manual and cranks are held in place by a screw-type clamp; locking is also manual. Thirty-two cranks are processed during one complete revolution. The milling cutters are carbide, turning at 303 rpm. Production is 80 pieces per hour.



Part of crankshaft line . .

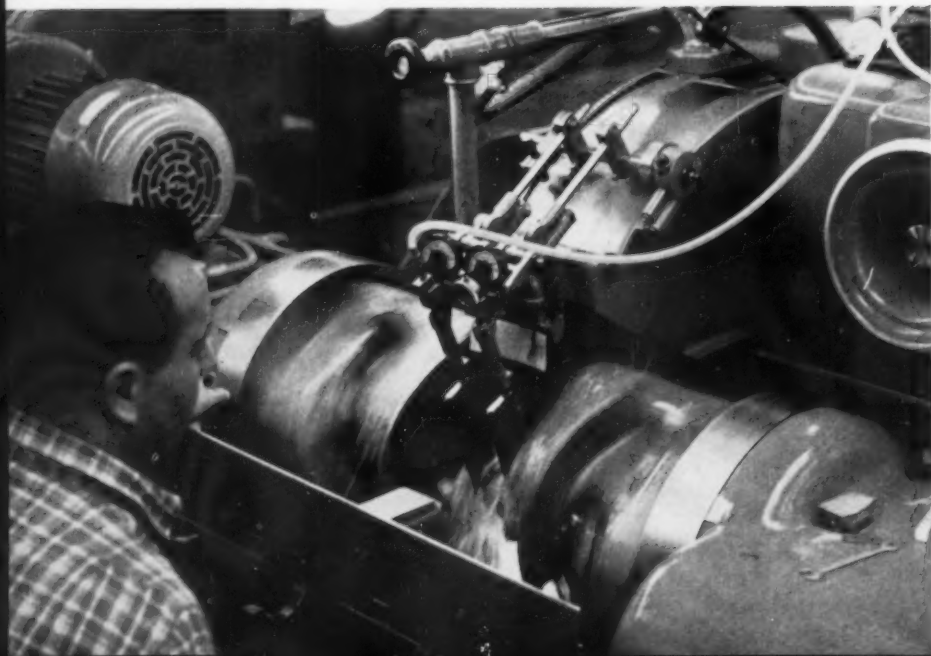
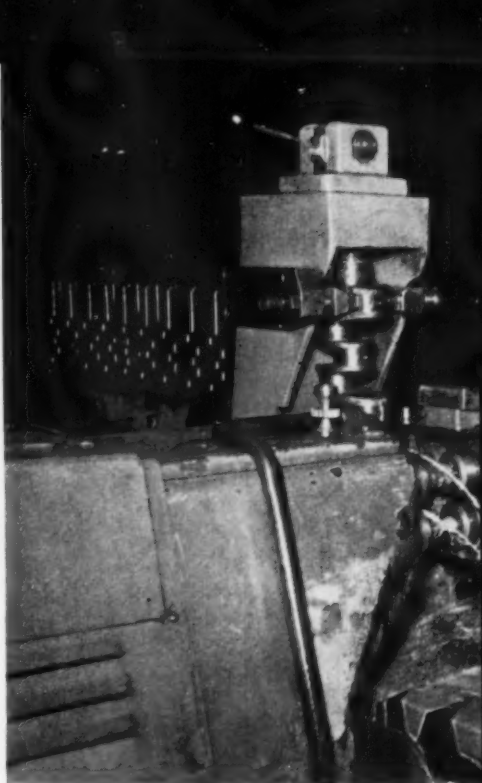
Shown at left is part of the crankshaft grinding line. Note the two conveyors extending the length of the line. Cranks are merely placed in grooves in the dolly and pushed forward, when filled, to the next person. Incidentally, the crankshaft is 13.46 in. long.

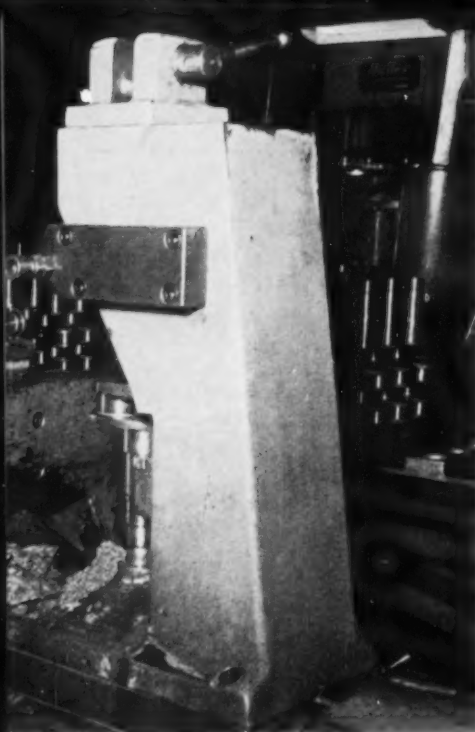
Volkswagenwerk

continued

Grinding two crankpins of crankshaft . . .

Each crankshaft has eight bearing surfaces having a hardness of 63 Rockwell. Sizing and operation of the machine is electronically controlled. Two allowable tolerance variations for the bearing surfaces and crankpins are approximately .000064-in. and .000044-in. A rough and finish grinding operation are performed to attain these sizes. A final lapping operation improves the surface finish to 2 micro inches. Extremely accurate lathe work on a Fischer Copying machine, where the main bearing surfaces are turned, is given credit for the subsequently accurate grinding operation. Other surfaces are turned on a Le Blond crankshaft lathe.



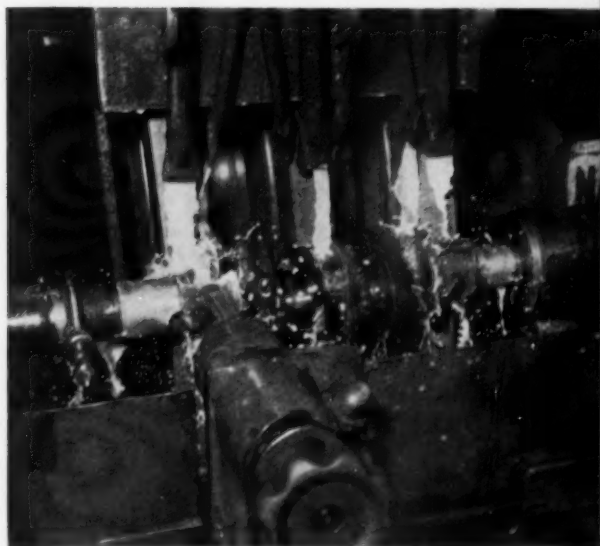


Cutting keyways in crankshaft . . .

This is a plunge milling operation on a special milling machine. Two fixtures are used, one is loaded while the other is engaged. Positioning is automatic off one of the throws. Machining cycle is likewise semi-automatic.

Finish grinding of three main bearing surfaces . . .

When finish grinding the three main bearing surfaces, the shoulder is ground at the same time. The wheel is a 40-60 grain wheel with an M hardness. Speed of the wheel is 7,722 F. P. M.



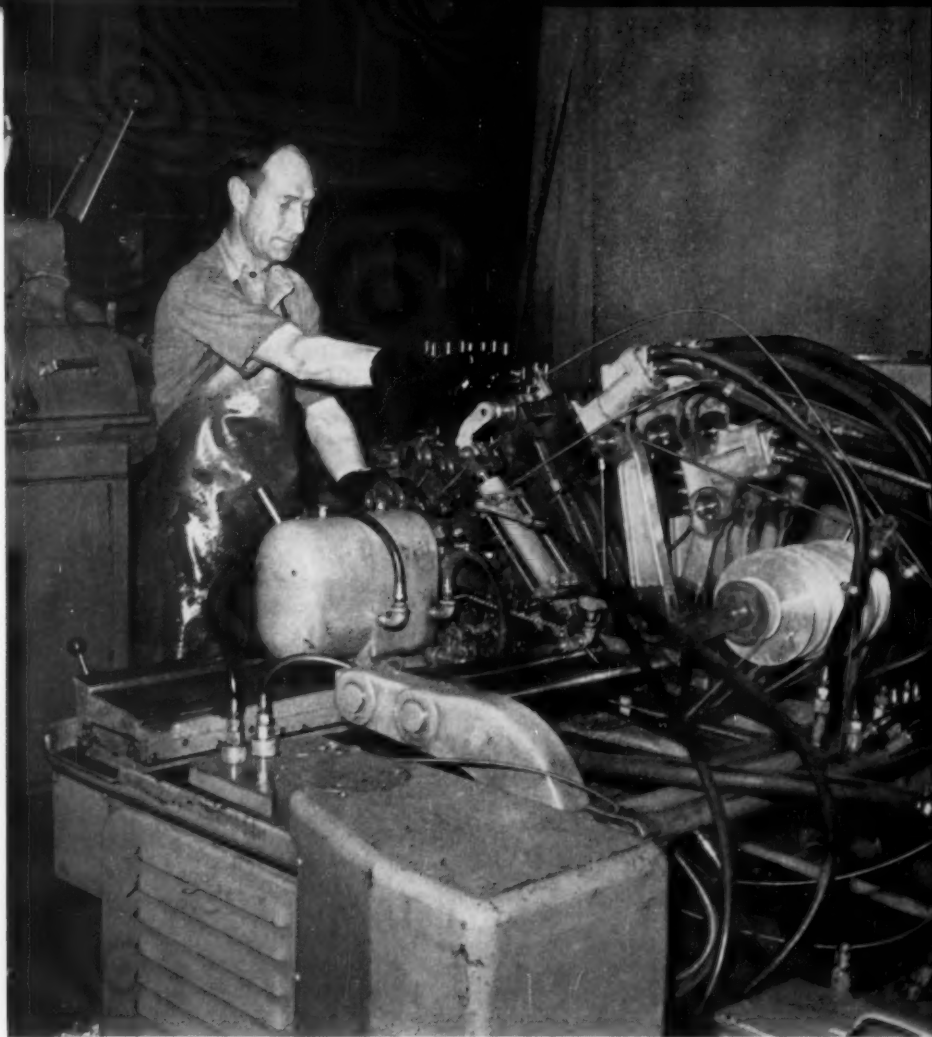
4 CYLINDERS OPPOSED!

Simplicity, ruggedness, smoothness

**Drilling oil lubrication
channels in the
crankshaft . . .**

When drilling the oil lubricating channels in the crankshaft, four holes are drilled on two machines. The machines are automatic except for the loading and unloading. Each hole is 3.52-inches deep and has an inside diameter of .24-inches. Production is 33 per hour.





Crankshaft lapping operation . . .

This is the crankshaft lapping operation where a surface finish of 2 micro inches is attained. All eight bearing surfaces are lapped simultaneously on this Norton machine. The emery cloth, Aloxite M 320 J, unravels from the large spools at the rear of the machine and is wound up on smaller spools in the front of the machine.



**26 camshafts on
this fixture . . .**

Milling the ends of the camshaft using a rotary type fixture. Twenty-six camshafts are on the fixture. Two ends are milled simultaneously with inserted-tooth milling cutters. Material is a special cast iron. Production is 150 pieces per hour.

**Camshaft Line
at
Volkswagenwerk**

**Milling, turning, grinding and
inspection procedures depicted**

*A tolerance of .0008 inches is maintained
on all camshaft diameters*

**Turning with a
copying lathe . . .**

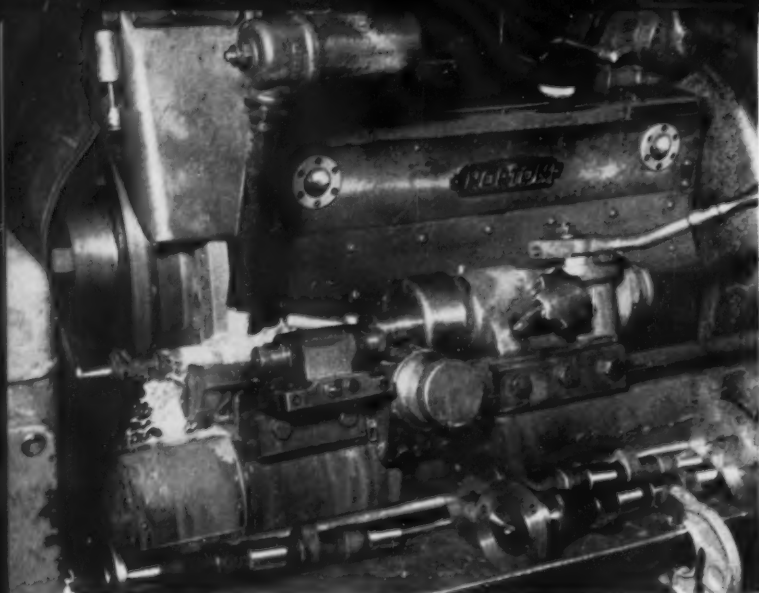
Turning operation on the camshaft with a copying lathe. The flange and three surfaces are turned with carbide tools. Depth of cut is .080-in. to .120-in. A tolerance of .008-in. is held. Two cutting speeds are used: for the flange, 825 rpm; for the surfaces, 1650 rpm. Production is 50 pieces per hour.



**3 bearing surfaces
ground simultaneously . . .**

Three bearing surfaces are ground simultaneously. The depth of cut is .020-in. The wheel speed is 4,620 rpm., the spindle turns at 445 rpm. The diameter of the wheel is 24-in. There is no automatic sizing attachment.





Rough grinding . . .

The headstock revolves at 115 rpm., while the grinding wheel has a speed of 4620 rpm. The wheel is aluminum oxide.

Finish grinding . . .

An automatic sizing arrangement is used, when finish grinding the camshaft. Pressure to the automatic sizing mechanism is by means of oil. The depth of cut is .160-in. Diameter of the vitrified aluminum oxide wheel is 24-in., grain size is 60. The wheel revolves at 4620 rpm. The final surface finish is 6 micro inches, obtained without lapping.

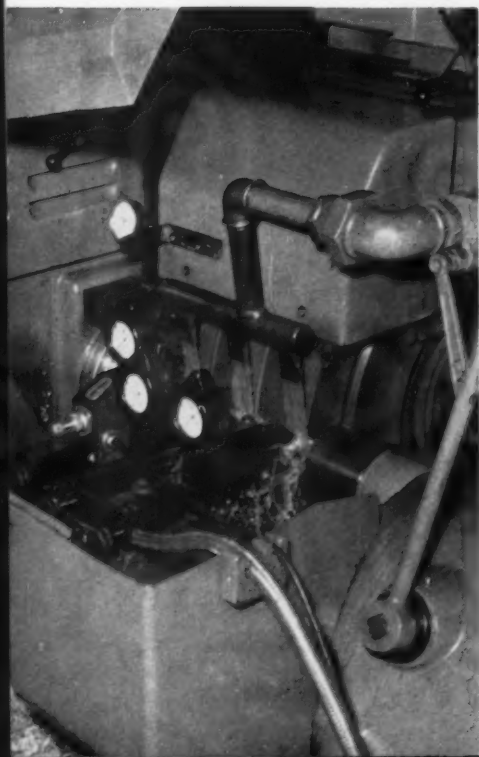


Volkswagenwerk

continued

Final inspection . . .

Final inspection of the camshaft. All diameters are checked simultaneously. A tolerance of .0008-in. is maintained. Lights on the upper panel signal unsatisfactory conditions.



The finished camshafts are washed prior to inspection.

Production at Volkswagenwerk

continued

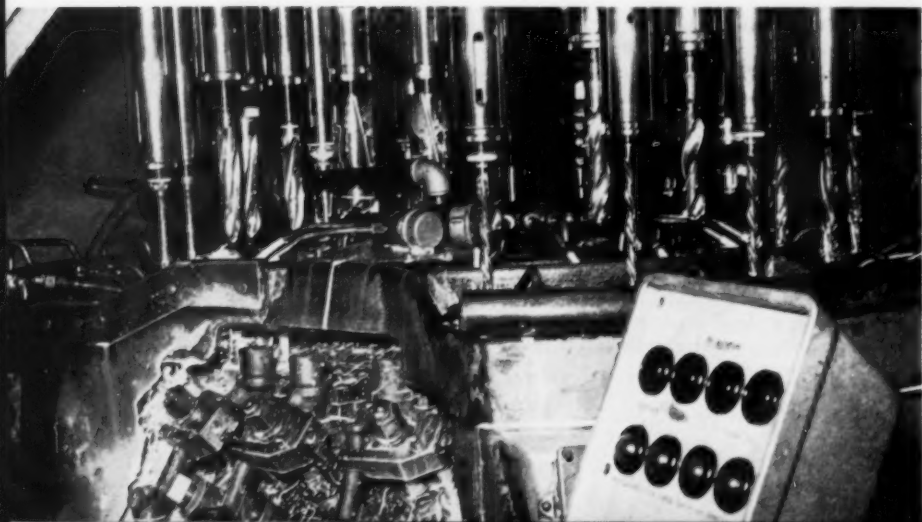


Finished camshafts are ready for the line or for storage.

Machining Trailing Link Arms at Volkswagenwerk

**Drilling 15 pieces
at one time . . .**

Drilling holes in lower trailing link arms. Diameters and depth of holes are: .479-in. dia., 1.64-in. deep; .780-in. dia., 1.40-in. deep; 1.070-in. dia., 1.60-in. deep. Fifteen pieces are drilled at one time on an 18 station machine. There are five drilling stations on the machine each drilling three parts per station. Machining time per station (three pieces) is .88 minutes. The arms are mounted and clamped by hand.





Six stations; four pieces per station . . . ↗

Machining upper trailing link arm. Twenty-four pieces are held in position, four to each station. Three stations perform the following: drill .640-in. hole; countersink .710-in. hole; ream .720-in. hole. The remaining eight spindles work through the work holding clamps which have been designed to act as a drill guide to drill holes for the subsequent broaching operation.

Broaching . . . →

Broaching square hole in the trailing link arm. Before broaching, the hole measured .770-in. dia.; after broaching the square hole measures .760-in. wide. This is a pull-through broaching operation. Production is 250 pieces per hour.





Turning torsion bar guide sleeve . . .

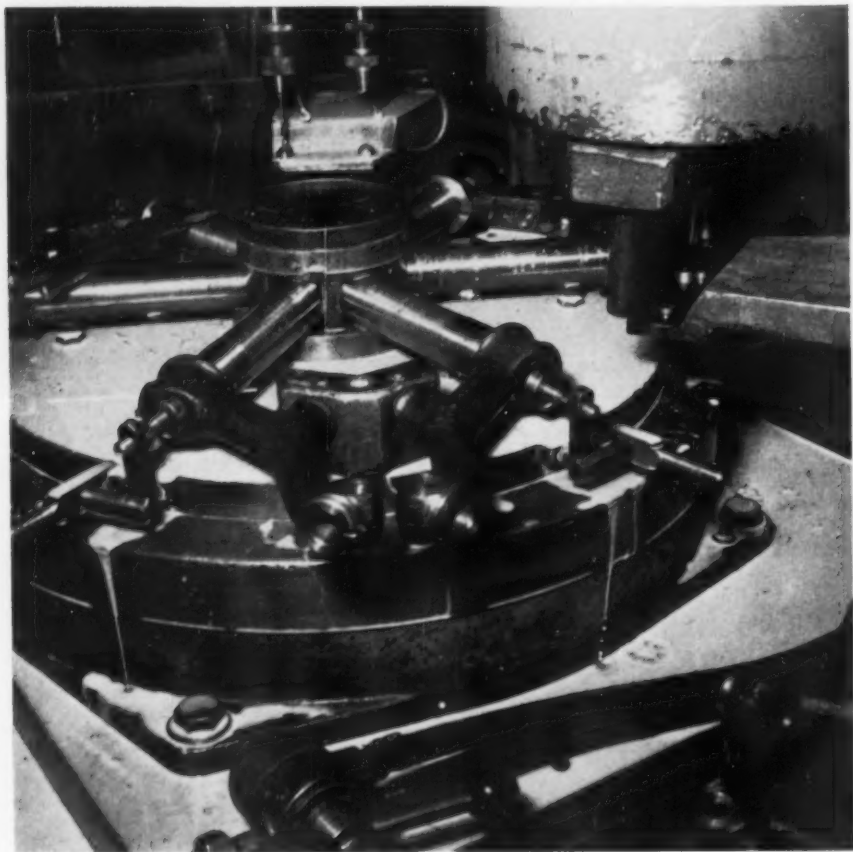
A Fischer copying lathe is used to turn the torsion bar guide sleeve on trailing link arms. Spindle speed is 2,970 rpm. Depth of cut with carbide tools is .040-.080-in. with a tolerance of .004-in. Turning tool operates from the bottom.



Pressing sleeve into trailing link arm . . .

Bolts for shock absorbers are pressed into position. Bolts are cooled to -180 deg. Fahr. and remain in chilling chamber three to four minutes.

VW's 1957 output is expected to exceed 400,000 units

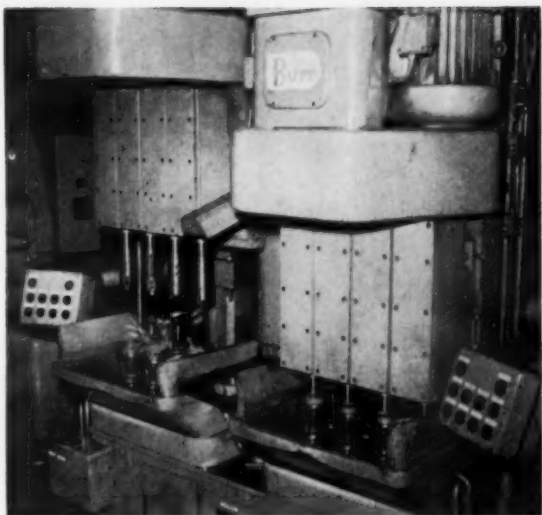


Drilling and Pinning Bolts . . .

Drilling the hole and pinning the bolts for shock absorbers with a straight pin. They are inserted into the drilled hole by hand and pressed into position with an hydraulic arbor. Production is 195 pieces per hour.

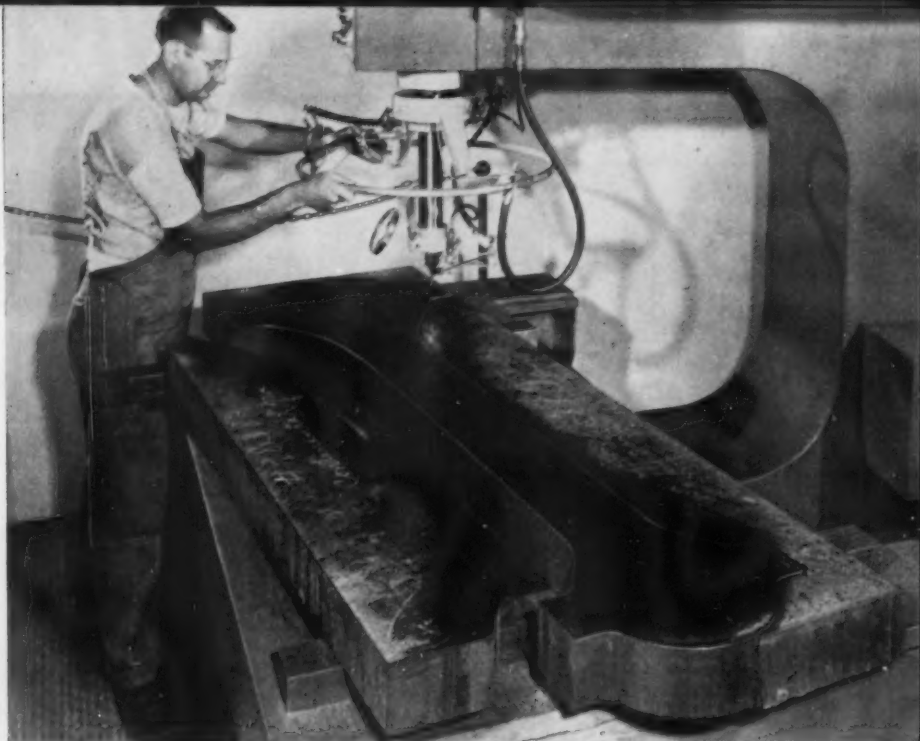
Finish boring operation . . .

Finish boring operation on cylinders. Spindle speed is 1,056 rpm., rate of feed is .026-in. Inside diameter of cylinder is 3.078-in. Tolerance is .0004-in. No diamond tools are used. Production is 120 pieces per hour.



Finished trailing link arms are ready for the line or for storage.





Courtesy The DoAll Company

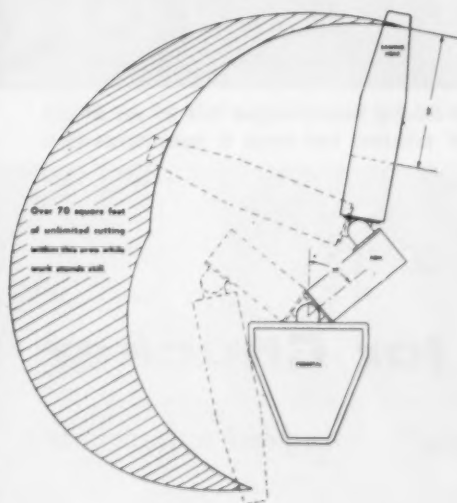
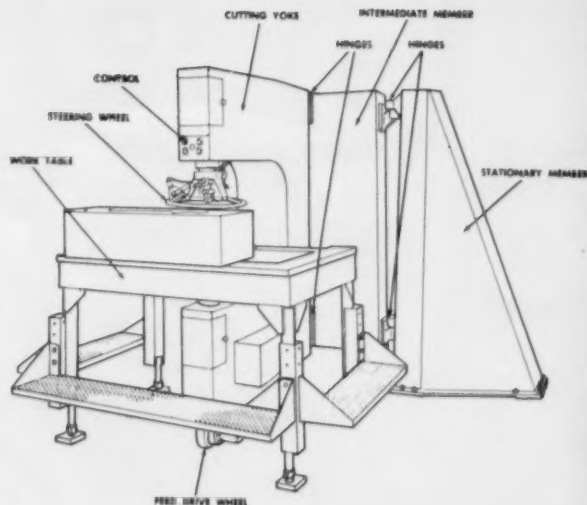
New concept in contour machining . . .

Work Stationary Tool Moves

● When a work piece is heavy, unbalanced or unbalanced it is easier to move the tool than to move the work. By fully utilizing this premise in the design of a contour sawing machine, it has been possible to produce the Model 5 contour band machine with a work capacity of 70 square feet and capable of taking a straight cut 14½ feet long.

The Model 5 will find wide applications in the air frame and shipbuilding industries where the machining of large intricate contours is regularly required. The production of large, off shaped parts, by the stack if necessary, in fabricating shops will be another application for this machine. The work for which the Model 5 is most ideally suited, however, is the machining of large dies.

The cutting and guiding mechanism is carried by a yoke housing all the necessary parts for the cutting and power feed. Yoke is fabricated of aluminum to reduce its inertia. Between the yoke and the stationary member which is fastened to the floor is an intermediate member. These three members are connected by hinges using anti-friction bearings. This design permits the saw blade to move within a 70 square foot area and to make a straight cut $14\frac{1}{2}$ feet long.



Because of the tremendous range in the size of the work that the Model 5 machine can accommodate, all of its potentialities have been by no means explored. A typical application is the machining of through apertures in large die blocks.



Cutting Head: The yoke houses a complete 4-wheel variable speed band machine. The upper and lower saw blade guides are mounted on tubular posts through which the saw blade travels. Both posts telescope to permit adjusting for work thickness.



1—ORIGINAL TWO-PIECE cast iron base for 9 $\frac{3}{4}$ inch chucking machine weighed 9479 lb., was difficult to keep aligned during machine assembly because of deflections from weight of superstructure as it was moved into place.

Welded Base

for Chucker

... greater rigidity, less weight, improved appearance

By **H. H. Ranney** and

John S. Miller

Cone Automatic Machine Co., Inc.
Windsor, Vermont

● Machine tool designers are faced with the constant struggle to keep abreast of progress and changing trends in metalworking. Widespread acceptance and use of carbide tooling demands increased machine rigidity and efficiency

without undue increase in weight. Integrating standard machines into automated lines means "custom tailoring" of work holding and work handling accessories. Greater convenience for operators, to allow them to handle several machines instead of one, frequently calls for major modifications in basic machine detail, and there is the unrelenting pressure of costs, of both machines and the work they do.

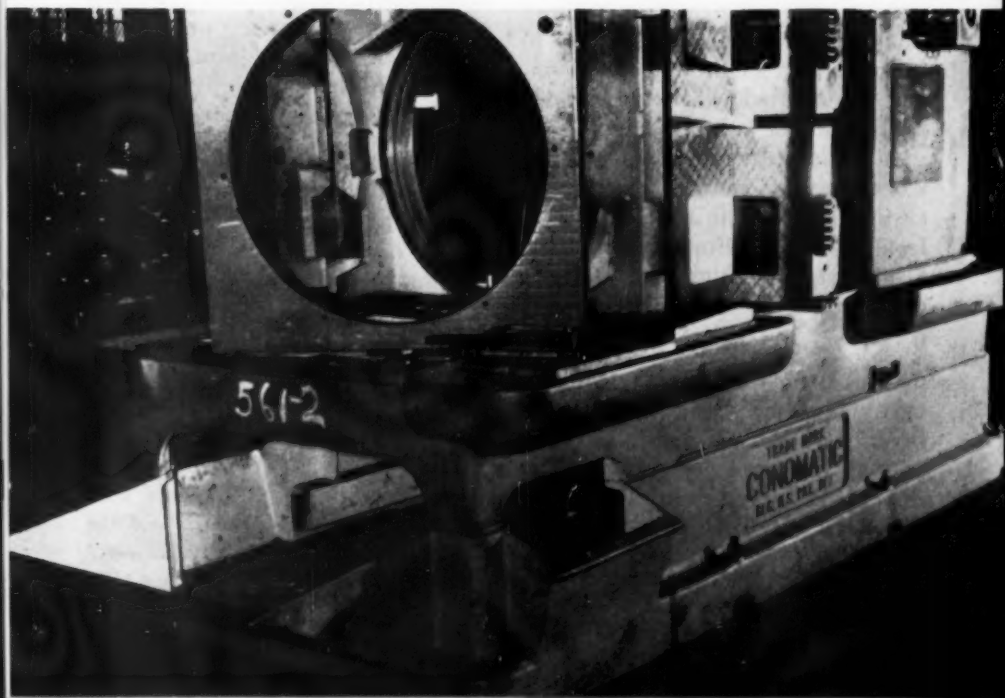
Automatic multiple-spindle bar and chucking machines are no exceptions to these elements of progress. When Cone Automatic Machine Company undertook the development of a new series of such machines about three years ago,

with the specific intent of providing units capable of making the fullest use of carbide tools, it became apparent that weldments should be given serious consideration for such components as bases and gear boxes, at least on pilot machines of the new line.

Five important advantages were recognized in welded construction: (1) Design changes more feasible in the development stage; (2) high strength-to-weight ratio; (3) increased rigidity; (4) faster deliveries, and (5) no pattern costs.

These were all borne out in construction of the pilot machines, and

2—REVISED DESIGN OF CAST BASE provided operator convenience at loading station by cutaway in splash pan, but foundry problems prevented making the same relief in the leveling flange on the lower base.



Welded Base for Chucker

continued

the groundwork was laid for a weldment program which is now expanding steadily and has been applied with notable success to the redesign of cast iron bases on older machine models to welded steel.

An example is the two-piece cast base for a 9 $\frac{1}{2}$ inch chucker, Figure 1. Demands for increased convenience of loading, tool adjustment and gauging of the work during setup dictated a redesign, illustrated in Figure 2. It is also cast in two sections, upper and lower. The upper portion is shaped with a cutaway on the splash pan to permit the operator to work approximately 8 inches closer to the loading area. However, to take advantage of this change, the leveling flange on the lower casting had to be similarly recessed for foot room and this created a difficult foundry problem. The abrupt change in section and the intricate molding work involved resulted in the first casting breaking in two as it came from the sand. Furthermore, pattern cost was high due to the numerous loose pieces and special coring.

A change to welded steel not only overcame the foundry difficulties but also added considerably to the appearance of the base, as may be noted from Figures 3 and 4, front and rear views of the

welded base. In designing the cast base shown in Figure 2, it was felt that continuation of the splash pan for the full length of the upper section added strength and rigidity, but at the same time it did not add to the overall appearance of the machine or its functioning.

It is necessary to mount air valves and related equipment in an accessible location for maintenance purposes. Casting a housing for these devices integral with the upper base would have complicated pattern and molding work to the point of being impractical.

With a weldment, the addition of this compartment was a relatively simple matter and provided protection for the pneumatic equipment during handling of the machine, as well as giving further enhancement to appearance.

In a study of machine loading convenience, it was found that the stature of the operator was an important factor when manual handling of parts being machined was involved. The machine center height is determined for the convenience of an operator 6 foot tall. A shorter man fatigues much faster unless provisions are made to adjust the loading height for him. This is done by providing a "toehold" at

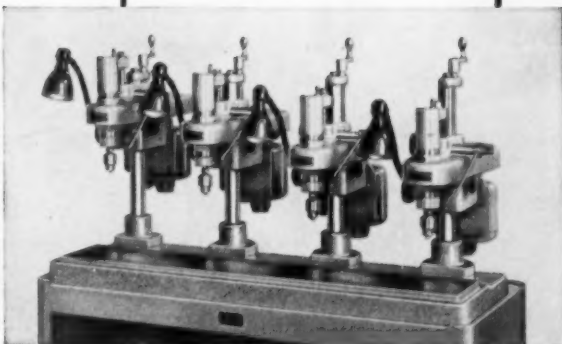
HAMILTON
SUPER SENSITIVE, SMALL-HOLE

PRECISION

REPEAT

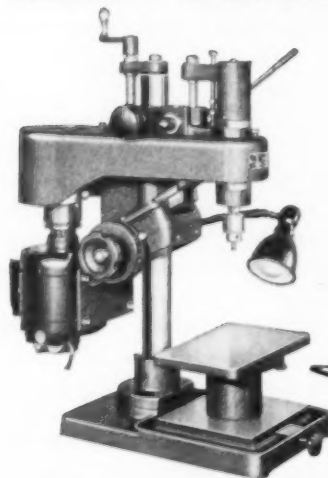
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SINGLE OR MULTIPLE SPINDLES • VARIOUS CAPACITIES • WIDE RANGE OF
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the heart-breaking jobs
which are so often attempted
on drilling machines of
“standard” accuracy.

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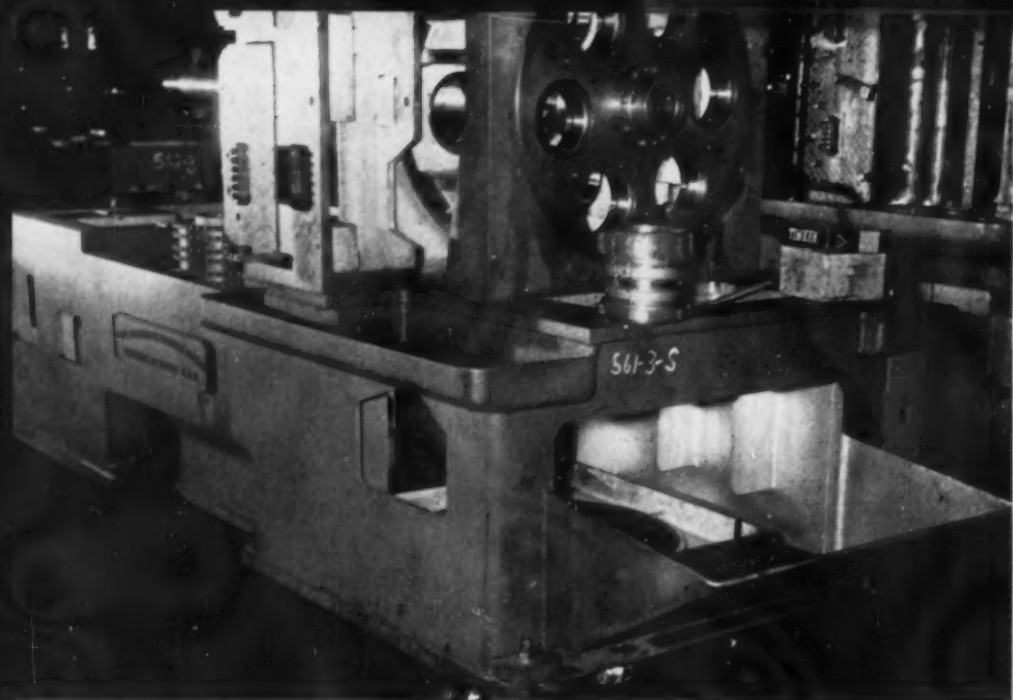
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2467



3—REAR VIEW OF WELDED STEEL plate base for the same machine during assembly. Improved appearance includes provision of a toe hole at the loading area which can accommodate a platform up to 8 inches high for shorter than average operators.

the normal working position of the operator, of such proportions that a platform up to 8 inches off the floor can be used with comfort equal to that of working at floor level. The toe hole is shown in both Figures 3 and 4.

During assembly of these automatics, particular attention must be paid to precision leveling of the base to insure proper alignment of the frame components at completion. With the two-piece cast base, this was troublesome because, as the heavy gear box and cross slide were installed, deflections invariably were encountered in the base,

often requiring additional scraping to correct alignment. The single-unit welded construction has reduced this deficiency to a great extent and on some units no adjustment of the initial level has been necessary.

The fabricated base, completely machined and ready for assembly, checked out at about 10% higher cost than the composite cast design. However, this figure applies to a single pilot weldment, with no jigs or fixtures used in the fit-up. In quantity lots, with manual fit-up time less extensive, appreciable savings are likely.

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ALL THE PRECISION YOU'LL EVER NEED



RIGIDITY and STAMINA TOO!

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May, 1957

135

Welded Base for Chucker

continued

Total weight of the cast base is 9479 lb., the weldment 5987 lb., a reduction of 37%. Weight of the complete machine with welded base is around 41,000 lb.

About 60% of the labor cost in preparing cast bases for assembly is charged to cleaning and preparation for paint, the balance to machining. Cleaning time is entirely eliminated on the weldment, and preparation for paint is reduced to about 10% of the overall cost of readying for assembly. Cost of finish painting is also reduced by about 20%.

Labor cost of machining and drilling the fabricated base is affected favorably by the fact that much of this work is done prior to welding. Small plate elements are obviously much easier to handle through machining than the 5-ton assembled castings, and less investment is required for special jigs and fixtures.

A coolant pressure chamber is conveniently located immediately under the general tooling area and is arranged so that the coolant can be piped readily from the chamber to the cutting tools as required for a variety of tooling arrangements. As cast integral with the upper base, the molding operation was extremely intricate and occasional difficulty was experienced with cool-

ant leakage and loss of pressure through porous castings. On the weldment, a standard 5 inch x 9 lb. per foot channel section forms this chamber.

Since the base is a combination coolant and lubricant reservoir, as well as a supporting member, a pressure-tight welding bead is essential, as well as one of sufficient strength to withstand abuse in handling the 41,000 lbs. of assembled machine. This is accomplished by specifying a 5/16 inch continuous butt weld at both the inside and outside vertical walls at the bottom plates. Side members and ribs to the top plate are 5/8 inch material of SAE 1020 analysis, providing rigidity in excess of that realized from the 7/8 inch walls of the two-piece cast design. A 1/2 inch bottom plate proved adequate since 1 x 6 inch leveling strips are provided at the edges, with four accessible leveling screws at each side. Internal joints have 5/16 inch intermittent fillet welds, with 50% spacing at the 1-1/4 inch top plate and upper rib members. All outside fillets are snagged smooth. The weldment is stress relieved at 1100-1200° F., and cooling time is predetermined for avoidance of any distortion.

On some of the earlier welded bases, complaints were received occasionally from the machine shop

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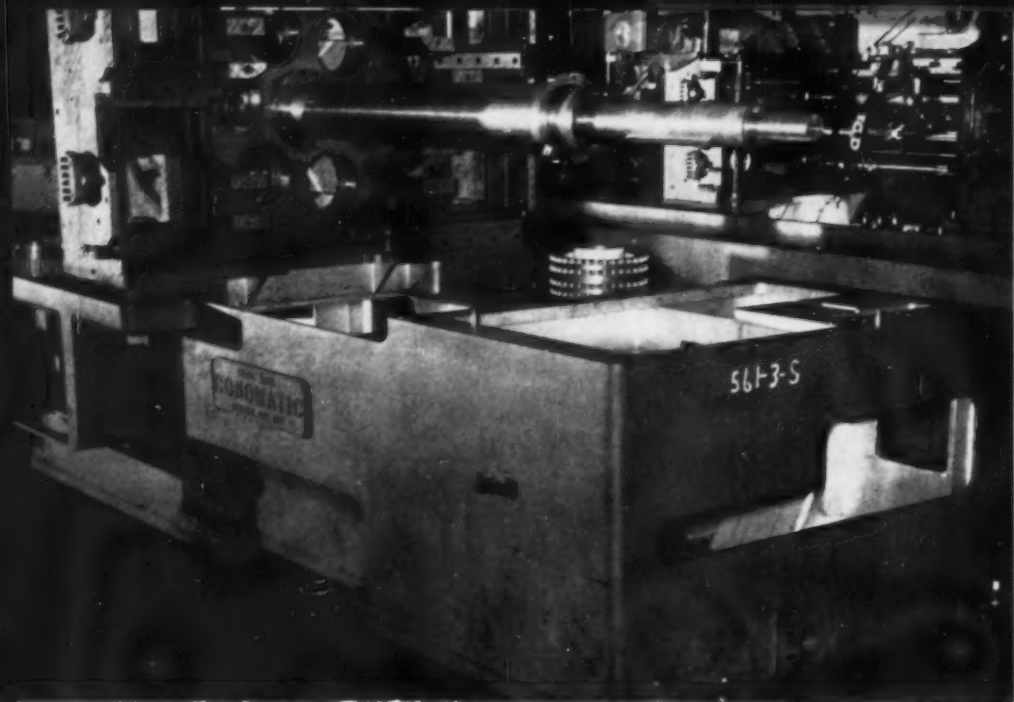
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4—FRONT VIEW OF WELDED BASE which is 37% lighter than the cast type, would cost less to build in small lots and is considerably more rigid to meet the demands of carbide tooling. Operator convenience also is greatly improved.

over difficulties in machining top plates to the desired finish. Consultation with steel sources resulted in changing the top plate to free-machining SAE C-1117 analysis, giving a much improved finish and a 25% reduction in planing time.

Among the advantages inherent in the welded design is the ease of making minor alterations in the base for special applications. If an extra machined pad is needed for mounting a non-standard attachment or work handling device, it is installed quickly by welding a steel plate of suitable size and shape to the desired location on an

existing base.

Success of the new design has led to a new program of weldment engineering, involving new bases for five other models of chucking machines. . . .

REPRINTS AVAILABLE

The following reprints are available from MACHINE & TOOL BLUE BOOK, 222 E. Willow Ave., Wheaton, Ill. Send for your free copy today.

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For the finest jobs...or the roughest jobs



Tooth pattern of Nicholson-made Swiss Pattern Square Handle Needle file, Cut No. 6, magnified approximately five times.



Tooth pattern of Nicholson-made 18-inch Flat Bastard file magnified approximately five times.

There is a Nicholson file for every purpose

Examine these close-ups carefully. They show several important points.

First, they indicate that Nicholson-made files are available in the widest spectrum of cuts. The cross section at left is magnified from our X.F. (*Extra Fine*) Swiss Pattern Square Handle Needle file, Cut No. 6, the finest cut we make. Our X.F. files are primarily finishing tools, used by tool and die makers, delicate instrument parts finishers and jewelers. And there are *seven* degrees of

fineness instead of the three found in conventional American pattern files.

The section at right is from our 18-inch Flat Bastard file. This rugged tool is used by any worker who wants to take off a lot of metal in a little time.

Secondly, notice the uniformity of tooth structure in the fine Swiss Pattern cut and in the big Flat Bastard. That means topnotch workmanship by Nicholson . . . and top results in your shops. Always specify Nicholson or Black Diamond files.



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Triple Cut Planing

Machining 4-edge shear knife finished from high carbon, high chrome steel, 10'-4" x 5" x 1 1/8":

Conventional planer with HSS tools 100.8 minutes

New standard planer with carbide tools . . . 50.2 minutes

**Universal planer with carbide tools
and triple cutting method 27.9 minutes**

• A new concept of high production planing—heavy cuts in both directions with equal feeds, speeds

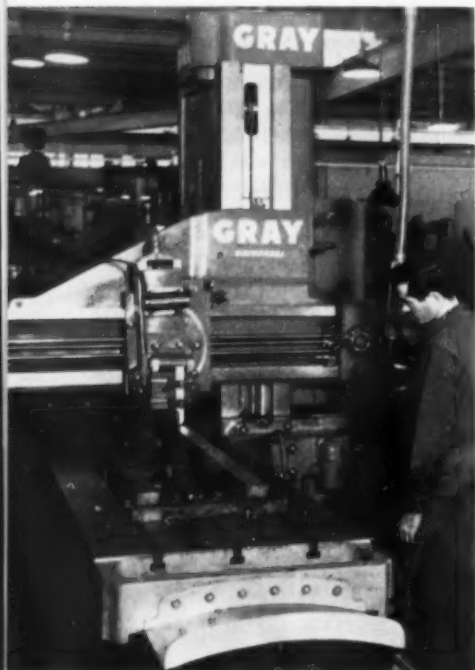
and depths of cut—has been introduced with the new Universal planer, product of G. A. Gray Co., Cincinnati. The flick of a lever and the touch of a button immediately converts the planer from double cutting to standard, conventional heavy duty planing with the traditional single point carbide tool.

The new double cutting technique may be simultaneously combined with the single cutting feature to obtain "triple-cut planing."

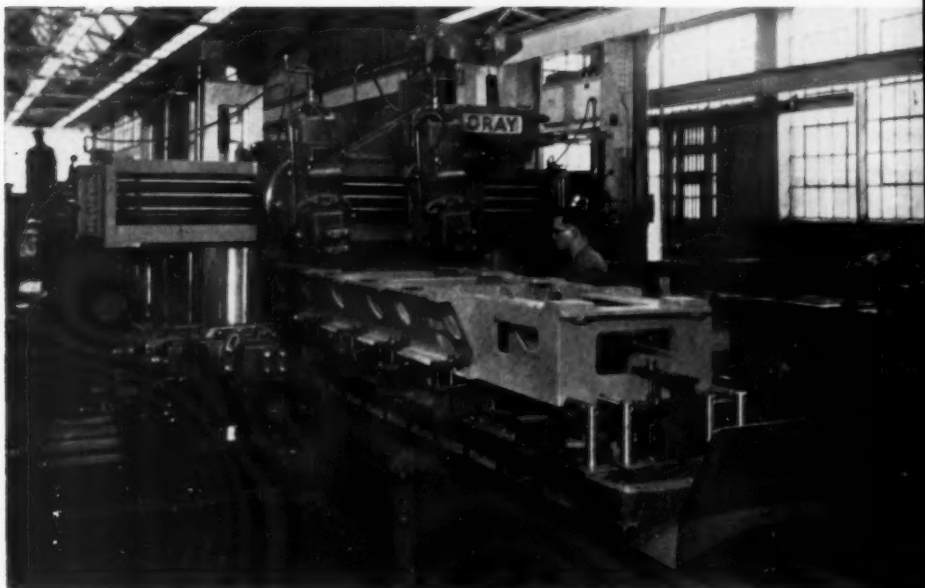
Rough and rough-finish planing are accomplished at the same time. The roughing is performed by the double cutting tool, while the rough finishing is accomplished with a



TRIPLE CUTTING STEEL RACK BLANKS with a 30-inch x 12-foot Gray openside planer.



Saves Machining Time



ADJUSTABLE, CONVERTIBLE OPENSIDE PLANER, 36-inches by 20-feet.

The double cutting tool holder (left) is shown immediately beneath the head, cutting in the conventional cut stroke direction. At the end of the stroke this holder automatically rotates through an arc of approximately 13 degrees against a massive, positive stop, and thus permits a second carbide tip mounted on the rear side of the tool holder to engage the work

piece on the return stroke. The rotation of the tool holder automatically provides proper clearance for the second carbide tip. The conventional broad nose rough finishing tool is mounted in the tool box ahead of the double cutting tool. It is set to a depth slightly below the double cut roughing tool, and it lags that tool by a fraction of an inch in the direction of the head feed.

Double cutting tools use standard tips, easy to change

single point broad nose tool. If the surface requires a precision finish, a second pass may be taken with the broad nose tool without a tool change. This is a completely new and advanced approach to the elimination of idle time.

A particularly interesting installation of a new Gray "Universal" Planer is found at the Textile Machine Works in Reading, Pennsylvania. (See illustrations.)

The new planer at Textile Machine Works features "duplex" or

split tables. While a piece is being machined on one section, the other section is parked, unloaded and reloaded. On jobs where set-up time is equal to machining time, the set-up time is virtually eliminated.

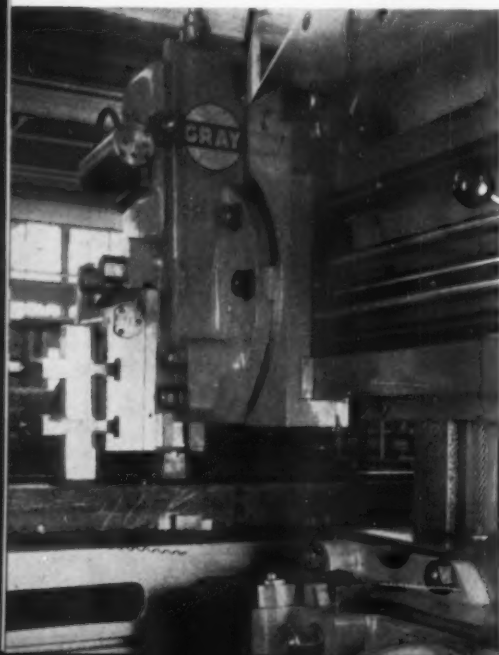
Illustration at top depicts the machining of the Textile Machine Works "Tricot" Machine base. This is a casting with a tensile Strength (core) of 34,000 p.s.i., Brinell Hardness (3000 Kg) is 401-444.

The cut averages $\frac{1}{8}$ " deep, the feed .050" per stroke or .100" per



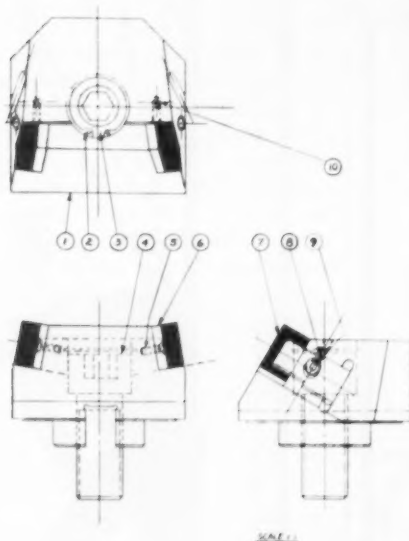
SIDE VIEW OF THE RAIL HEAD taking cut on steel rack blanks.

So as to provide greatest versatility with maximum head utility, the left hand auxiliary housing is slidably mounted on its outboard runway. It may thus be moved in (for narrow work) or out (for wide work) and thus position the left hand side head ideally for its most effective cutting position. The rigidity of the heavy duty openside design is materially enhanced by the support afforded by the left hand housing. Should unusually wide jobs necessitate such action, the left hand auxiliary housing may be completely removed from the machine.



cycle. Cut speed averages approximately 200' per minute.

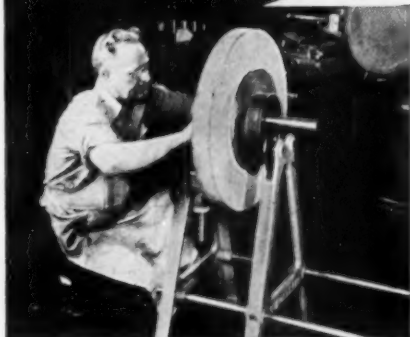
The former floor to floor machining time for this job, by old-style methods was about 62 hours. By utilizing the new double cutting and triple cutting techniques, the Textile Machine Works will reduce its floor to floor time to 12 hours. Textile accordingly expects to do the job in about one-fifth the time formerly required. . . .



VARIATION OF DOUBLE CUT TOOL HOLDER developed by Textile Machine Works to utilize smaller clamp-on type throwaway carbide tips.

(1) base; (2) retaining ring; (3) washer; (4) cap screw; (5) flat machine screw; (6) shims; (7) bits; (8) clamp; (9) cap screw; (10) set screw.

Balancing Tools for a Wide Range of Work



Here's a complete line of Balancing Tools which will save their cost quickly on balancing or truing operations. Accurately sensitive and durable, they provide a simple, reliable means for checking the balance of parts like gears, shafts, fly wheels, pulleys, etc. The standard sizes available are shown in capacity chart below.

CAPACITIES

Swing	Between Standards	Weight Capacity
21 in.	20 in.	12 lbs.
21 in.	20 in.	800 lbs.
43 in.	29 in.	800 lbs.
43 in.	29 in.	2,000 lbs.
6 ft.	5 ft.	5,000 lbs.
8 ft.	8 ft.	10,000 lbs.
Any	Any	24,000 lbs.
43 in.	30 in.	800 lbs.

FREE DATA



You can obtain complete information on Sundstrand Balancing Tools by writing for bulletin 479.

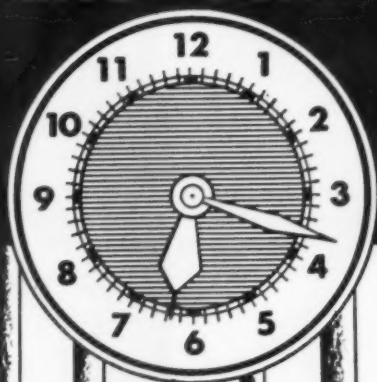


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Should you

Repair or Replace

that drilling machine?

The average plant owner with diversified types of work can hardly afford to think along the same lines as proposed by the formulae written about machine replacement in the plant large enough to afford complete machine and tool change-over. Here the author attempts the difficult task of evaluating the "when and how" to replace machine tools in the average size plant.

by **R. H. Rideout**, Chief Engineer,
Drill Division,
Buffalo Forge Co.

● When should the average shop repair a drilling machine, or replace it?

If parts are available and the cost of repair or rebuilding is not excessive, machines can be rebuilt to give many years of continued service. Obviously, if a machine is

completely worn out, or is obsolete, it may be next to impossible to procure parts necessary to repair or rebuild. Such machines should be relegated to the scrap pile or foundry cupola.



Equipment Replacement

continued

There is need, however, at this point, not to let one's thinking become "penny-wise and pound-foolish." Perhaps, because of the nature of the work, increased production is not essential.

Sometimes handling-time exceeds machining-time and a new machine capable of faster operation would not be of material benefit.

A careful study is needed. If yearly production warrants, additional operators can be added. If so, new machines would pay for themselves in short order. No two shops being similar, it is impossible to write a formula or rule which would govern a decision.

There are, however, other considerations. One is safety. State Labor Laws are stressing this more and more. In the not-too-distant future line-shaft drives and unprotected machine elements will be outlawed. This should receive careful consideration before entering a rebuilding program on a large scale.

When, after weighing these various factors, you decide that replacement of machines is desirable, the next step is deciding what kind of machine is best suited for your needs, present and future.

First in importance is drilling capacity. Do your requirements call for both large and small holes?

Perhaps more than one size machine would be best, in order not to tie-up a large machine for drilling small holes that could be done on a smaller and less expensive one. If most of the work calls for a machine of larger capacity, perhaps not too much time would be wasted in using it to do small work. If sequence of operation is such that one operator can handle several spindles, a multiple-spindle machine is certainly in order. One operator can easily handle four spindles, hand or power-fed, and in many instances can easily handle six, especially if some are equipped with power feed.

Almost any machine required is available, and the size and type is dictated by the requirements of your shop. A stationary-head machine with hand feed, $\frac{1}{2}$ " capacity, will suffice in many cases, especially where parts are small and production is high. This type can also be obtained in capacities up to 1" in cast iron, in single-spindle bench and floor-type and multiple-spindle bench and pedestal styles. Machines in this capacity range are also available in the sliding-head type, both in hand and power-feed models. They can be had in single-spindle bench and floor-type and in multiple-spindle bench and pedestal models. The sliding-head type machine is easier to "set-up"

and is generally preferred for all-around shop use. Machines of larger capacities are usually

equipped with back-gears and power-feed in floor or pedestal models. Multiple-spindle drills are

**SPEEDS, FEEDS & LUBRICANTS USED IN DRILLING
VARIOUS MATERIALS WITH HIGH SPEED STEEL DRILLS**

MATERIAL	DRILL HARDNESS	DRILL SPEED FPM	FEED	COOLANT OR LUBRICANT	POINT ANGLE DEGREE	FLIP CLEAR ANCE DEGREE	HEAT ANGLE DEGREE	REMARKS	RECOMMENDED MINIMUM R.P.M. OF MACHINE			
									UP TO 1 1/2"	UP TO 1"	UP TO 1 1/4"	UP TO 2"
ALUMINUM	100	200	MEDIUM	2/3 LARD OIL 1/3 KEROSENE	110	12	32-45		1/3	3/4	2	3
ALUMINUM	170	80	MEDIUM	2/3 LARD OIL 1/3 KEROSENE	110	7-10	15-30	120°-130° CHISEL POINT	1/3	3/4	2	3
BRONZE	170	80	MEDIUM	2/3 LARD OIL 1/3 KEROSENE	110	7-10	15-30	120°-130° CHISEL POINT	1/3	3/4	2	3
BAXELITE	170	80	MEDIUM	NONE	90	13-15	10-17	DON'T OVERHEAT	1/3	3/4	3	3
BRASS	180	200	HEAVY	2/3 LARD OIL 1/3 KEROSENE	110	12-15	6-17		1/3	3/4	2	3
BRONZE COMMON	180	200	HEAVY	SOLUBLE OIL OR OIL	110	12-15	6-17		1/3	3/4	2	3
BRONZE WALF HARD	180	175	MEDIUM	SOLUBLE OIL	110	10-12	15-30		1/2	3/4	3	3
CAST IRON SOFT	125	140	HEAVY	NONE	80	12	24-32		1/3	3/4	2	3
CAST IRON MEDIUM	180	80	MEDIUM	NONE	90	12	24-32		1/2	3/4	2	3
CAST IRON HARD	200	40	LIGHT	SOLUBLE OIL	110	10-12	24-32	ANNEAL IF POSSIBLE	1/2	1	3	5
CAST IRON CHILLED	400	15	LIGHT	LARD OIL AND TURPENTINE	150	5-7	24-32	SURFACE "SKIN" EXTREMELY HARD	3/4	2	3	5
CAST STEEL	200	80	LIGHT	SOLUBLE OIL	110	13-15	24-32	ANNEAL WHENEVER POSSIBLE	3/4	2	3	5
COPPER	80	70	LIGHT	SOLUBLE OIL	100	12-15	28-40	CHIP SHOULD "PEEL OUT"	1/3	3/4	2	3
COPPER FORGING	170	80	MEDIUM	LARD OIL SOLUBLE OIL	110	13-15	24-32	ANNEAL IF SOFT IS TOO HARD	3/4	2	3	5
CORALUMIN	80	200	MEDIUM	2/3 LARD OIL 1/3 KEROSENE	170	12	32-45		1/2	3/4	2	3
EVERDUR	200	80	LIGHT	REFRIGERANT OR OIL	110	13-15	10-17	WATCH FOR HEAT	1/2	3/4	2	3
GLASS	200	15	LIGHT	TURPENTINE	30	60		USE CARBIDE TIPPED DRILL				
MACHINERY STEEL	170	130	HEAVY	SOLUBLE OIL	100	12-15	24-32		3/4	2	3	5
MALLEABLE IRON	110	80	HEAVY	SOLUBLE OIL	110	13-15	28-40		1/3	3/4	2	3
MARBLE	130	15	LIGHT	NONE	60	10-15	28-40	TURPENTINE MAY HELP				
MILD STEEL 20-30 CARBON	170	130	HEAVY	SOLUBLE OIL	110	12-15	24-32		3/4	2	3	5
NICKEL	170	80	MEDIUM	LARD OIL	110	13-15	24-32		1/3	3/4	2	3
NITRALLOY 130	250	30	LIGHT	SULPHUR-BASE OIL	125	7-10	24-30	120° CHISEL POINT	3/4	2	3	5
RUBBER HARD	200	150	LIGHT	NONE	80	13-15	10-17	DON'T OVERHEAT	1/2	3/4	3	5
SLATE	200	15	LIGHT	NONE	130	13-15	28-40	USE CARBIDE TIPPED DRILL				
SPRING STEEL	400	20	LIGHT	SULPHUR BASE OIL	130	7-10	24-32	DO NOT FORCE THE FEED	3/4	2	3	5
STAINLESS STEEL	140	30	MEDIUM	SULPHUR BASE OIL	110	12	24-32	MAINTAIN CONSTANT FEED	1	2	3	5
STAINLESS STEEL (COLD ROLLED)	400	20	LIGHT	SULPHUR BASE OIL	125	10-12	24-32	MAINTAIN CONSTANT FEED	2	3	5	7 1/2
STEEL 40-50 CARBON	170	80	MEDIUM	SOLUBLE OIL	110	13-15	24-32		1	2	3	5
WOOD HARD	200	100	LIGHT	NONE	80	15-20	28-32	DO NOT OVERHEAT	1/3	3/4	2	3
TOOL STEEL	150	70	HEAVY	LARD OR SOLUBLE OIL	110	12-15	24-32		1	3	5	7 1/2
TOOL STEEL	150	80	MEDIUM	LARD OR SOLUBLE OIL	110	13-15	24-32		1	3	5	7 1/2
TOOL STEEL	240	30	MEDIUM	LARD OR SOLUBLE OIL	125	10-12	24-32		1	3	5	7 1/2
TOOL STEEL	200	40	LIGHT	LARD OR SOLUBLE OIL	125	10-12	24-32	USE COBALT DRILLS	1	3	5	7 1/2
TOOL STEEL	250	20	LIGHT	LARD OR SOLUBLE OIL	130	7-10	24-32	USE COBALT DRILLS	2	3	5	10
TOOL STEEL	400	15	LIGHT	LARD OR SOLUBLE OIL	150	7-10	24-32	USE COBALT DRILLS	2	3	5	10

*Use Cobalt Drills

**KEY TO
FEED
PER REV.**

DRILL INCH	HEAVY FEED IN.	MEDIUM FEED IN.	LIGHT FEED IN.
1-4	0.008	0.005	0.0025
1-2	0.010	0.0075	0.004
3-4	0.015	0.010	0.006
1	0.020	0.012	0.0075

Equipment Replacement

continued

offered in pedestal models only.

The type is generally dictated by usage or preference, also cost. The least expensive, of course, is a vee-belt drive direct from motor to spindle.

The life of a vee-belt is so long and performance so efficient, that the time required to replace or change speeds on multiple stepped-pulleys is considered of no consequence. Some builders use all-gear drives for heavier machines, which naturally are in a higher price bracket.

Another drive is the direct "motor-over-spindle" arrangement where the motor has a hollow shaft through which the spindle operates. The objection to this drive is that the highest speed also has the highest horse-power value which is op-

posite the condition required: namely, higher horse-power at low speed. Too, these machines are much more expensive than machines driven with vee-belts.

Within the past twenty years, variable-speed machines have been introduced to the market. These are rapidly gaining favor, since the variation of speeds is infinite and does not limit the speed as does a four-speed motor over-spindle-drive or multiple-step pulley drive.

So, analyze your requirements before you make your choice: hand-feed or power-feed-bench, floor or pedestal model—single spindle or multiple-belt-drive, geared-drive—motor-over-spindle drive, or variable infinite-speed drive. It's your shop and only you can decide if the time is right to replace and what to replace with. • • •



2-AND 4-SPINDLE 22" Buffalo Forge drilling machines at Zenith Carburetor Co., Detroit, Mich.

You buy Scully-Jones "PREMIUM FEATURE" FLOATING HOLDERS AT NO PREMIUM IN PRICE!

These benefits . . .	for these reasons . . .	result from these PREMIUM features
HIGHER QUALITY WORK	No "binding" or dead spots to cause bell-mouthed, out-of-round, or poorly finished reamed holes. No oversized or tapered threads when tapping.	1. Exclusive double-gear spline drive provides a balanced, constant velocity, and a flexible drive coupling which permits freedom of lateral or angular movement.
LOWER CUTTING TOOL COSTS	No "cramping" to break fine cutting edges.	2. Two thrust bearings placed close together and independent of drive, as well as proper clearance in the spline, allow tool to float freely and quickly into proper alignment.
INCREASED PRODUCTION	Less downtime due to cutting tool breakage.	3. New Lock-and-Eject Type Check (Style "JT" only) eliminates need for conventional-type drift.
LOWER MAINTENANCE COSTS	Positive, self-lubricating action practically eliminates wear.	4. "Rocking" action with spline drive coupling causes continuous flow of lubricant in and out of splines, and cushions drive against torsional shock and overload. Shell houses floating and driving elements, and acts as perfect seal for lubricant.
LOWER TOOLING COSTS	Holder may be used for most class-nuts and multiple-spindle operations.	5. Small body diameter.
	Requires little space between spindle and work.	6. Minimum body projection (Style "JT" and "JS").

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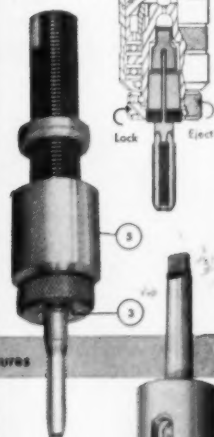
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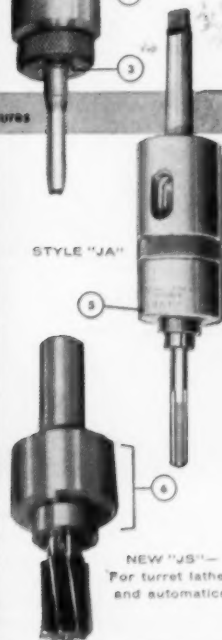
Scully-Jones and Company, 1907 South Rockwell Street, Chicago 8, Illinois

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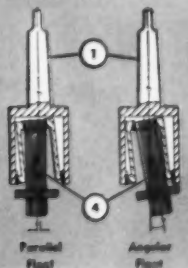
NEW "JT"—
Lock-and-Eject
Collet Type



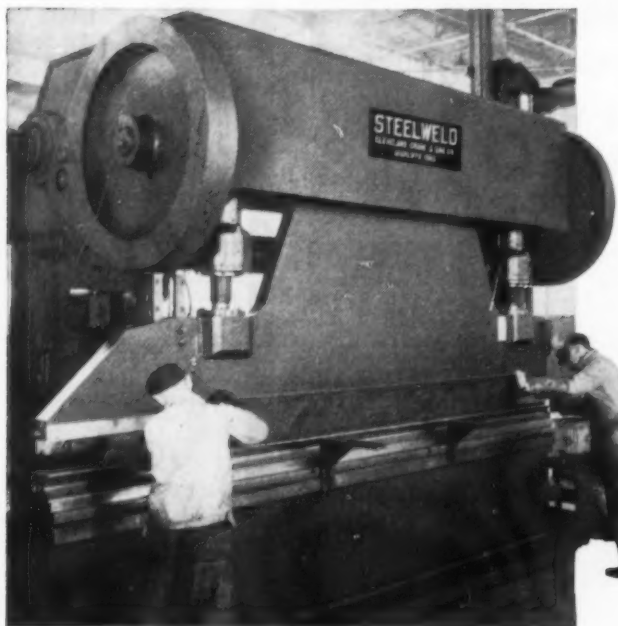
STYLE "JA"



NEW "JS"—
For turret lathes
and automatics



Accurate Records Prove LOW COST OPERATION



The simplicity and ease of operation makes this press a favorite with the operators. This machine works steel plate to 16'-0" x $\frac{1}{4}$ ".

SOME YEARS AGO the Pershing Road Plant of Link-Belt Company, Chicago, established a record system for keeping track of repairs and maintenance costs of all machine tools. This system provides a detailed history of maintenance required and lists every item of expense for every machine.

The record system proves that the maintenance

cost for Steelweld machines, both bending presses and shears, is comparatively low.

Because of this, and the fact that Steelweld machines have many desirable operational features, a number of which are unavailable elsewhere, Link-Belt regards them highly. In fact, so much that 20 Steelweld Presses and Shears are now serving Link-Belt plants in nine cities.



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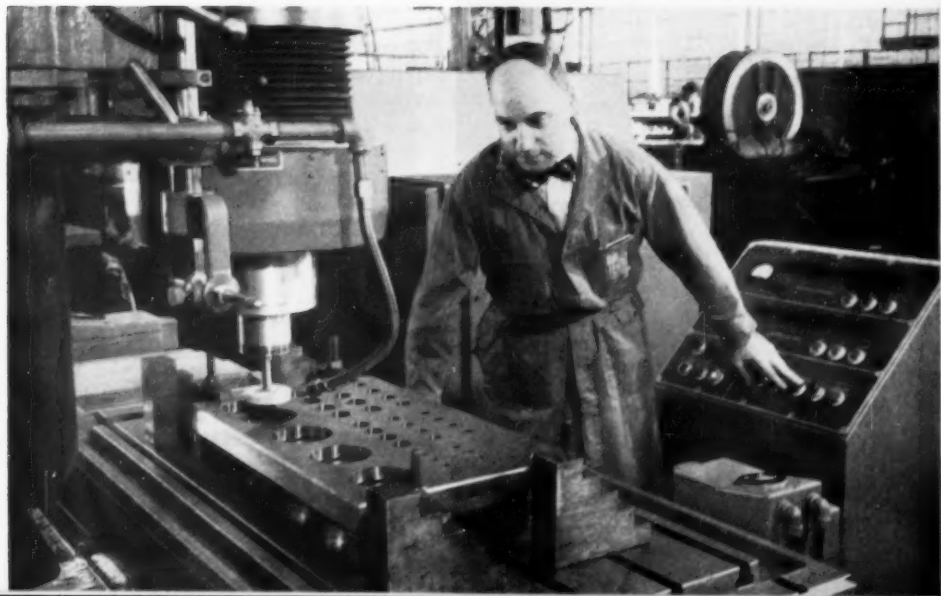
WEST HARTFORD, CONN.—The development and perfection of a wholly new system of numerical control as applied to its line of Jig Borers, Vertical Hole Grinders and Rotary Tables by Pratt & Whitney Company, Inc., a subsidiary of the Penn-Texas Corporation, makes

possible automatic accurate positioning within one ten-thousandth of an inch.

The first of these units have been delivered to the Aircraft Engine division of Ford Motor Company in Chicago, Ill.

Under Pratt & Whitney's numerical

NUMERICAL CONTROL automatically operates this Pratt & Whitney Vertical Precision Hole Grinder. Demonstration workpiece is accurately positioned by numerical information punched into tape. Operator's control panel at right.



control system, all blueprint data needed for locating, indexing, boring and grinding is stored on punched tape and translated directly into mechanical action by the machine. The system actually feeds blueprint information directly to the machine.

Chief among Pratt & Whitney's "Numerical Control" features are:

1. Elimination of human error in reading or setting dials or verniers.
2. Ability to rapidly set all slides and verniers simultaneously.
3. Reduction of scrap losses and consequent cost reduction.
4. Increased operating speeds and efficiency.
5. Minimum setup time.
6. Constant precision since the machine is automatically controlled.

7. Fewer jigs and fixtures.

8. Faster cycle times resulting from automatic operation.

All of the company's Series E Jig Bore, Vertical Precision Hole Grinders and Rotary Tables are supplied with highly accurate Electrolimit measuring systems which are capable of settings accurate to .0001 inches, or five seconds of arc.

Pratt & Whitney's "Numerical Control" is based on the common decimal system (decimal of an inch and decimal of a degree of arc), and the dimensions shown on a blueprint are punched on tape as easily as numbers are tabulated on an adding machine.

With a pneumatic sensing system for its Tape Reader, air is forced through holes in the tape to an enlarged chamber with a neoprene diaphragm which provides enough force to operate a reliable industrial control limit switch.

The tape is moved into position and stopped automatically. It is at the stopping point that all data on the tape necessary for a single operation is read at one time and presented automatically to the machine. When the machine operation has been completed and checked, the tape can be advanced one block so that new information may then be presented. • • •

DIGITAL INFORMATION punched into tape (foreground) automatically operates Pratt & Whitney Vertical Precision Hole Grinder (background) built for Aircraft Engine division of Ford Motor Company, Chicago. Operator's control panel at left.



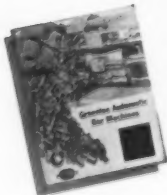
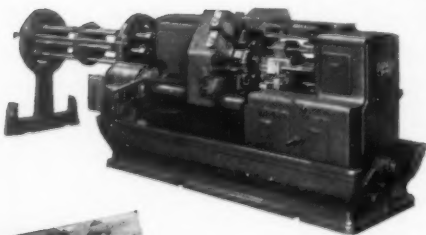
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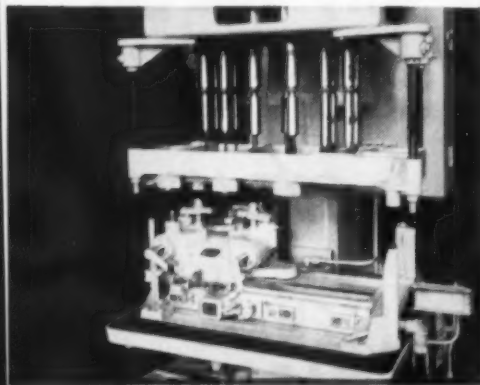
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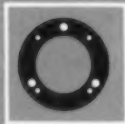
**Cost-Cutting Ways
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Standard Multi-Spindle Natcos

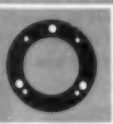
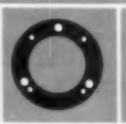
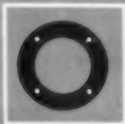
Any time your parts require machining *more than one hole*—drill, bore, face or tap—it may well be a "Natco Natural." Your standard Natco will produce substantial savings in a surprising number of situations, *even in small job-shop lots!* Call in your nearby Natco field engineer; he'll tell you in short order whether you've got a "Natco Natural" there.



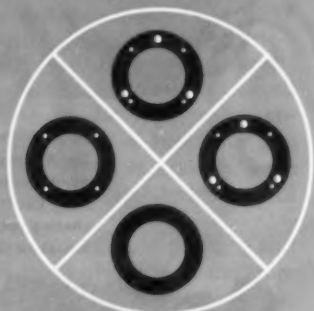
Straight-line indexing on a Natco H6 produces 49 parts per hour. 4 holes drilled in first position, 3 holes drilled in second position, 4 holes c'bored in third position. One part completed every three strokes. Automatic cycling frees operator for other work. Illustrations below show three other ways of handling this part.



45 parts per hour. Inexpensive box jig. Operator positions jig under appropriate spindles. One complete part for 3 strokes of machine.



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Standard multi-spindle Natcos range from 1 hp, 10-spindle machines to 25 hp machines with up to 72 spindles. Spindles in standard Natcos are driven through universal joints and located by either adjustable arms or bored slip plates.



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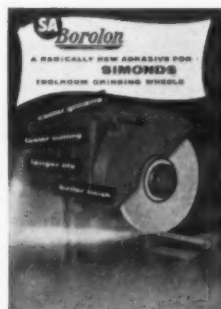
FREE LITERATURE

MACHINE AND TOOL

blue book



(See Number 1)



(See Number 2)



(See Number 3)

1. Mill Head No. 120 features infinite speed 100 to 3600 rpm, infinite power feeds from 0 to .012 per revolution both up and down. Rate of feed can be selected with machine running, standing still, or under load. Rusnok Tool Wks., 4840 W. North Ave., Chicago.

2. Grinding Wheels. Friable aluminum oxide abrasive grain being used in the manufacture of SA Borolon grinding wheels is produced in single crystal form without crushing. Bulletin ESA-272 from Simonds Abrasive Co., Tacony & Fraley St., Philadelphia 37, Pa.

3. "Horizontal Redraw Presses" describes complete line of horizontal, multi-station, automatic redraw presses for quantity production of straight and shouldered deep shells in wide variety of sizes and shapes. Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

4. Air Sander. Description and specifications of a light weight air sander are available in Bulletin No. 800-1. Model 800 orbital sander weighs only three lb. Magnetic-Pneumatic Div., Sundstrand Machine Tool Co., Rockford, Ill.

5. Tool Holder. Folder tells how to save 50% to 70% of normal thread-cutting time with Speed-Thred tool holder. Warner Development Co., Dept. RB, P. O. Box 33, South Beloit, Ill.

6. Magnetic Drives. Data on design, drive features, operating and performance curves, output torque rating-dimensions, selection chart, as well as photographs of applications, are included in brochure from Whitney Chain Co., 237 Hamilton St., Hartford 2, Conn.

7. Pallet Transfer Assembly Machine. Folder PT-10 describes machine available in standard sections. By combining 3, 4, 6 and 8 ft. sectional horizontal ways with necessary end sections, practically any size of in-line or island arrangement is practical. Syracuse Special Machine Co., Inc., 2900 E. Erie Blvd., Syracuse 3, N.Y.

8. Parts Feeder. Feeding, orienting, counting up to 200,000 items per hour can be accomplished with the Hoppermatic parts feeder described in Brochure B-31. U. S. Engineering Co., 40-24 22nd St., L. I. City, N. Y.

9. Quality Control Equipment for supervision, inspection, and production operations is described in bulletin No. QC-1056. Visi-trol Engineering Co., Dept. BJ, 9345 Hubbell, Detroit 28, Mich.

continued

10. Gas Appliances. Bench furnaces, Bunsen burners, hand torches, melting furnaces, melting pots, pipe burners, etc., are discussed and illustrated in catalog from Reliable Machine and Mfg. Co., Inc., Cedar Rapids, Ia.

11. Air Control Manifold. Catalog 956 describes the $\frac{3}{4}$ " and 1" manifold and new $\frac{1}{2}$ " size. Many of the controls required in air pressure applications are combined in these units. Republic Mfg. Co., 15655 Brookpark Rd., Cleveland 11, O.

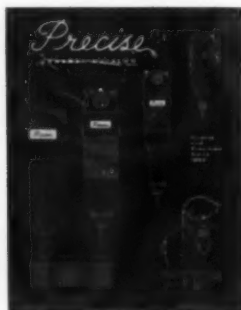
12. "This is Ross Valve" is a picture story of the Detroit company, starting with its inception in 1921 and progressing through its various stages of growth to present-day modern facilities. Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich.

13. Master Feeder. The Burns style taper lock master feeder feeds both hot rolled and cold finished stock. Illustrated and described in Bulletin No. 50. Sutton Tool Co., Sturgis, Mich.

14. Heat Treatment. The 32-page booklet, "Specialized Equipment and Skills Devoted Exclusively to the Heat Treatment and Processing of Metals" has been prepared by Pittsburgh Commercial Heat Treating Co., 49th St. and A.V.R.R., Pittsburgh 1, Pa.



(See Number 14)



(See Number 16)



(See Number 20)

15. Specialties. Clamp support blocks, strap clamps, stud sets, studs, T-slot nuts, coupling nuts, flange nuts, lead hammers are presented in folder from Podlin Tool Co., 11911 Franklin Ave., Franklin Pk., Ill.

16. Storage Racks. Catalog No. 303 answers many storage rack problems. Illustrations show bar, vertical, sheet steel and die storage racks. Pollard Bros. Mfg. Co., 5504 N. NW Hwy., Chicago, Ill.

17. Stub Taps designed, developed, and manufactured specifically for use in screw machines are described in circular from Pratt & Whitney Co., Inc., West Hartford, Conn.

18. High Speed Tools. General catalog introduces new Super 80 Power Quill, a versatile $1\frac{1}{2}$ hp tool with variable speeds from 7000 to 25,000 rpm. Precise Products Corp., Racine, Wis.

19. Wall Chart of Conversion Factors. Reference table speeds up the location of common conversions such as inches to centimeters, watts to hp, cu. ft. to liters. Precision Equipment Co., 3714 N. Milwaukee Ave., Chicago 41, Ill.

20. Horizontal Boring, Milling Machine, the Wotan B85, has a wide range of application, convenient and rapid engagement of all speeds, simple directional control of all movements. Parker Machine Co., Inc., Dept. BB, 150 Pioneer St., Brooklyn 31, N. Y.

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Free Literature

continued

21. Jig and Fixture Components. Catalog No. 26 covers 400 components for jigs and fixtures, including three new types of toggle shoe clamps. Northwestern Tool & Engin. Co., 118 Hollier Ave., Dayton 3, Ohio.

22. Plate and Sheet Metal Work. Booklet 203 summarizes important data on power operated machines for plate and sheet metal work. Niagara Machine & Tool Wks., 683 Northland Ave., Buffalo 11, N. Y.

23. Gear Honing Process is described in Bulletin H-57-2. Improves sound qualities of hardened spur or helical gears by removing nicks and burrs, improving surface finish, and correcting minor heat treatment distortions. National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.

24. Special Tooling Services offered by NTDMA members are listed in 68-page pocket size directory. National Tool & Die Manufacturers Assoc., 908 Public Sq. Bldg., Cleveland 13, O.

25. Turret Tool Posts with clamping type handle that is claimed to assure positive locking and withstands vibration even when handling interrupted cuts is described in catalog from McCrosky Tool Corp., Meadville, Pa.

26. Pins, Pointed Wire Products made of brass, carbon steel, stainless, Monel metal are illustrated in flyer from Robert A. Main & Sons, Inc., Dept. RS, 50 Pascack Rd., Paramus, N. J.

27. Pantograph Engraving Machines, cutter grinder, name plate edging machine, sensitive drill press, and hand tapping machine are presented in Catalog No. 57. Mico Instrument Co., 80 Trowbridge St., Cambridge 38, Mass.

28. Two Diameter Drilling. Subland vs step drills are subject of illustrated booklet available from Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.

29. Lathes, Series 80 Dyna-Shift lathes are equipped with headstock that "thinks." Automatic calculation and set-up of spindle speeds, plus instantaneous, finger-tip hydraulic shifting. Monarch Machine Tool Co., Sidney, Ohio.

30. Two-Way Drilling Machine, Model 350-S, drills either two, five or six equally spaced holes arranged in a circular part. Morris Machine Tool Co., 933-24 Harriet St., Cincinnati 3, O.

31. Collapsible Tap. Bulletin G-95 gives detailed specifications and includes applications and illustrations of Style LL tap. Landis Machine Co., Waynesboro, Pa.

32. Pumps, Gas Boosters, Air Motors. Catalog No. 1957 describes rotary air and vacuum pumps, gas boosters and air motors, giving details of construction, dimensions, capacities, new performance curves, installations. Leiman Bros., Inc., 102 Christie St., Newark 5, N. J.



(See Number 27)



(See Number 29)

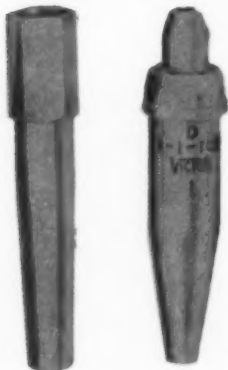


(See Number 31)



VICTOR TORCH with cutting tip of Anaconda Tellurium Copper, which has the resistance to heat and wear required to maintain uniform flame characteristics through a long life of service.

Tellurium Copper makes better cutting and welding tips



Two typical Victor torch tips of Anaconda Tellurium Copper-127 shown full size.

THE PROBLEM: Victor Equipment Company of San Francisco first used regular leaded copper rod in making tips for its line of cutting and welding torches. In some applications, however, the leaded copper did not stand up under high heat conditions.

THE SOLUTION: Victor tried Anaconda Tellurium Copper-127 Rod and found the answer. The Tellurium Copper had a much higher heat resistance. This meant long, trouble-free service for its precision-made cutting and welding torches in all types of applications. At the same time, the Tellurium Copper provided uniform machinability, especially important in drilling the deep holes prior to completion by swaging on mandrels.

FREE TECHNICAL SERVICE: No matter what your special problem may be, The American Brass Company can very likely furnish free-cutting copper and copper-alloy rod to meet the requirements of the product or the operation.

It is the function of the Technical Department of The American Brass Company to assist metal users in the selection of Anaconda Rod. This service is at your disposal without charge or obligation. Comprehensive data on composition and machinability of standard Anaconda Rod Alloys, together with specification references, weights and dimensions, are available in Publication B-3. For this booklet—or technical assistance—write: The American Brass Company, Waterbury 20, Conn. 106

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Free Literature

continued

33. Dials. No. 956 universal tailstock dial is supplied with reference pointer and self-tapping screw. Offers precision control for operations usually performed with the tailstock. No. 351 cross slide dial has colored reference markers, estimates to .00025. Folder from Lloyd Tool Corp., P. O. Box 647, Burbank, Calif.

34. Relief-Type Fitting. Bulletin BU-61 presents fitting which can be attached easily to bearing housings of motors, machines or pillow blocks equipped with conventional relief plugs. Keystone Lubricating Co., 3100 N. 21st St., Philadelphia.

35. Magnetizers. Folder on two principal types of magnetizers, the electromagnetic and the permanent-magnet type is offered by the Indiana Steel Products Co., Valparaiso, Ind.

36. Positioning Table. Numerically controlled positioning table has a hole-to-hole speed of 150" per minute. Eliminates drill jigs. Bulletin from Jones & Lamson Machine Co., Springfield, Vt.

37. Polishing, Buffing, Grinding, deburring and dust collecting machinery is described in Catalog No. 65. Hammond Machinery Builders, 1600 Douglas Ave., Kalamazoo, Mich.

38. Surface Grinder. The TML 6x12 surface grinder has been completely re-engineered. Literature is being distributed by Harig Mfg. Corp., 5751 W. Howard St., Chicago 31, Ill.

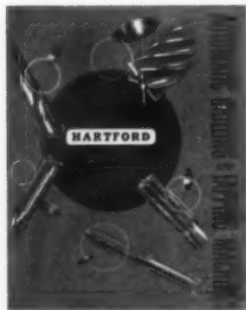
39. Drilling, Tapping Machines. Typical methods of operation are shown in Catalog DM-101. Components, thread rollers, superspacers are also described. The Hartford Special Machinery Co., Hartford 12, Conn.

40. Drills. Flat twisted and rolled section high speed drills are catalogued in publication issued by Hi-Duty Drill Wks., Fleetwood, Pa.

41. Packaging Cost Reduction—from original package design to final product shipment—is subject of revised Little Packaging Library booklet published by Hinde & Dauch, Sandusky, Ohio.

42. Turret Drilling. Applications covered in brochure include consecutive operations in a single hole location, straight line hole patterns, single bolt circles, concentric bolt circles, and random hole patterns in one plane and in many different planes. Howe & Fant, Inc., East Norwalk, Conn. Request "Drama in Drilling."

43. Featherweight Fasteners. Catalog describes advantages of Huckbolt fasteners for aircraft application, both pin type and stump type. Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Mich.



(See Number 39)



(See Number 42)



(See Number 43)

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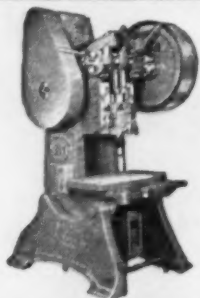
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Free Literature

continued

44. Air Control Valves. Nopak-matic valves, described in Catalog No. 105, are available for 2-, 3-, and 4-way operation, with master (air), single or double solenoid pilot control. Pipe sizes from $\frac{1}{4}$ " through $\frac{3}{4}$ ". Galland-Henning Nopak Div., 2754A S. 31st St., Milwaukee 46, Wis.

45. Control for Resistance Welding. Bulletin GEA-5945A, eight pages, discusses all facets of this control equipment, lists typical areas of application, explains benefits of synchronous precision control for resistance welding. General Electric Co., Schenectady 5, N. Y.

46. Computer which may be applied for the rapid solution of any formula involving two variables raised to any power or root, and a constant. Booklet, "Fascination in Numbers," is being offered with computer by Graham Transmissions Inc., Menomonee Falls, Wis.

47. Power Units, Test Stands. Bulletin H-257 describes hydraulic power units and test stands, includes engineering drawings. J. N. Fauver Co., Inc., 49 W. Hancock, Detroit 1, Mich.

48. Gear Drives. Bulletin No. 107A describes small E series roller gear drives for indexing of O. E. M. machines and instruments with low torque requirements and a need for indexing rates up to 2000 rpm. Ferguson Machine Corp. of

Indiana Roller Gear Div., P. O. Box 5841, St. Louis 21, Mo.

49. Drill Presses. Specifications are given in booklet for floor and bench, single and multiple spindle models in several basic sizes. Delta Power Tool Div., Rockwell Mfg. Co., 470 N. Lexington Ave., Pittsburgh 8, Pa.

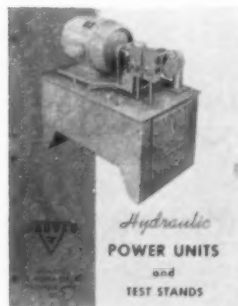
50. Lathe Chucks. Burnerd lathe chuck and Griptru catalogs, complete with price lists, are available from Dewitt Equip. Corp., 188 Elizabeth Ave., Newark 8, N. J.

51. Brinell Hardness Tester. A four-page bulletin describing their air operated Air-O-Brinell metal hardness tester is available from the Tinius Olsen Testing Machine Co., 5818 Easton Rd., Willow Grove, Pa.

52. "O. G. P. Multi-Use Stage" is an 8-page booklet describing the versatile holders recently developed by Optical Gaging Products, Inc., 26 Forbes St., Rochester 11, N.Y., to stage parts on optical comparators.

53. Brushes. Rota-Master brushes are made in 16", 18" and 24" face widths. For cleaning conveyor belts, material spreading, dust removal, finishing. Folder from the Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

To receive copies of literature described on these pages, simply encircle corresponding numbers on handy postage-free Action Cards opposite page 64.



(See Number 47)



(See Number 50)



(See Number 53)



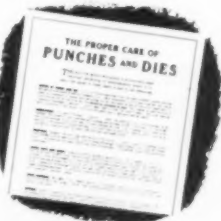
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Remember—*only* CINCINNATI Grinding Wheels give you . . .



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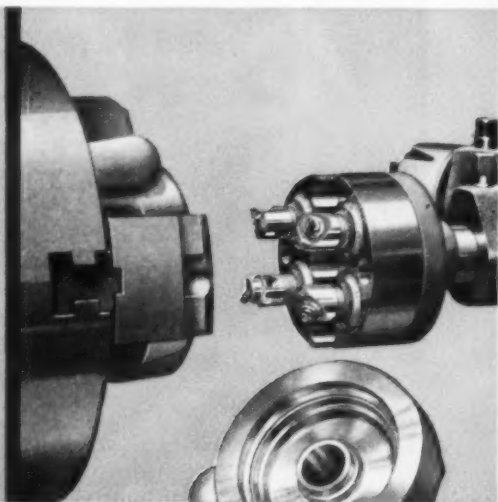
CINCINNATI[®]
Grinding Wheels

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The diagram shows a cross-section of a mechanical assembly with various components labeled with numbers and dimensions. The top part of the assembly has a width of 80. Below this, there are several horizontal dimensions: 312, 364, 396, and 364. A vertical dimension of 15' is indicated on the right side. The main body of the assembly has a total length of 1430. Other vertical dimensions include 1250, 3013, 3281, 3246, 3362, and 3666. The bottom part of the assembly has a width of 15'. The text at the bottom indicates that surfaces machined are indicated by heavy lines.



This Special Microbore Production Tooling was designed for a well known hydraulic pump manufacturer to machine pump covers on a turret lathe. Operations include precision boring and turning thirteen diameters and faces in only two passes. Think of the costly manhours saved and down time eliminated in comparison with conventional, piecemeal methods of handling this same job.

point permits accurate settings in a matter of seconds. On piece after piece, machined surfaces are held to extremely fine limits.

Microbore is a versatile tool that can be applied singly or in clusters for all types of boring, turning and facing operations. Microbore also manufactures Standard Boring Bars, Boring Bar Sets and Microbore Flash-Change Tooling—the ultimate for quick change tooling.



DeVlieg MICROBORE SYSTEM

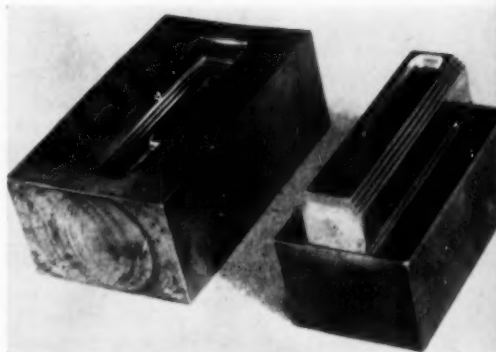
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Method for Localizing Pressure While Hubbing a Die Insert

By H. J. Gerber

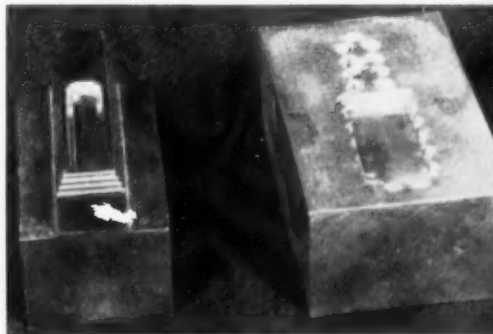
• Die inserts or plastic molds often have "proud projections" which are upward raised areas in the mold cavity. When these mold cavities are produced by hubbing with a hardened and polished steel master or hub such projections are often difficult to form clean and sharp. In order to force the flow of metal upward into the projection some shops follow the procedure of pre-machining the cavity and projection and use the hub for finishing only. This involves considerable expensive machine work, particularly when many identical inserts are needed.

The two photos illustrate another method used by one shop to facilitate the flow of metal when sinking a die cavity of this sort. In photo No. 1 a completed die insert, (actually a plastic mold) with a projection in the cavity, is shown alongside the hardened and polished hub which was used to pro-



1. On left is completed die insert (or mold) showing raised area in cavity. At right is hardened and polished hub with cavity in its face. This cavity corresponds to the projection in the cavity of the completed die insert.

2. Same hub as above alongside die insert which is now bottom side up. Depressed area in bottom of the die insert shows where hardened steel block (not pictured) has been placed to facilitate the flow of metal upward into cavity in hub face. Blind holes were drilled to further assist this concentration of metal flow. Actual shearing away of this area to a limited depth is apparent.



Shop Hints

continued

duce it. The projection in the mold was produced by the cavity in the face surface of the hub.

Photo No. 2 shows the same hub alongside the die insert which is now bottom side up. A series of blind holes have been drilled around the perimeter of the area which will be contacted by the cavity in the hub face. A small flat piece of hardened tool steel (not shown) has been placed between the press platen and the bottom of the die insert block and inside the area enclosed by the drilled holes. When pressure is applied on the hub this area is deformed upward before the hub penetrates its full depth into the die insert. It will be noticed that these drilled holes permit this area on the underside of the die insert to partly shear away from the adjacent metal as it flows upward.

The pictured die insert was made from one of the free flowing mild hubbing steels.

This method is used by several shops which I have visited and is reputed to permit a job of this type to be done on a press of lower than recommended capacity. . . .

Cut Off Tool

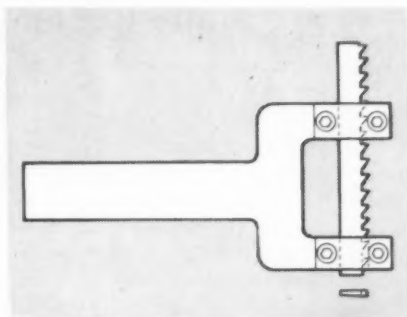
By Clifford Molloy

- We operate a number of hand screw machines in our shop and have developed the cut off tool shown in the drawing. It uses rake type hand saw blades.

These blades are cut to length and ground flat on the surface grinder, with the back edge thinner than the front. Two 1/64" deep slots in the holder

locate the blade and it is secured with two cross straps. One tooth is used at a time and the blade is shifted when that tooth gets dull.

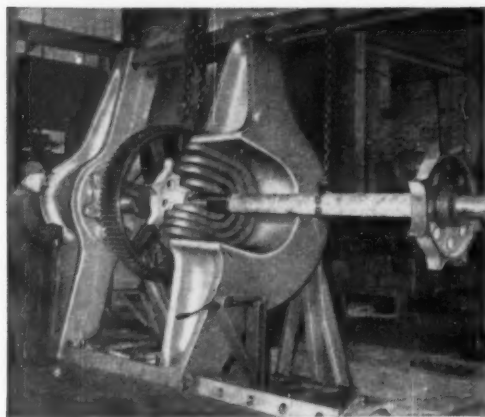
This tool makes a very thin cut and



we developed it when we were running some electrical parts made of silver. Since that time we have found it useful on a number of other jobs. . . .



A MOUNTAIN *of* POWER



POWER FOR BIG JOBS—Here a Rodgers 600-Ton Inclined Forcing Press is forcing a large gear and sprocket from a mine machine shaft.

—or a touch of pressure

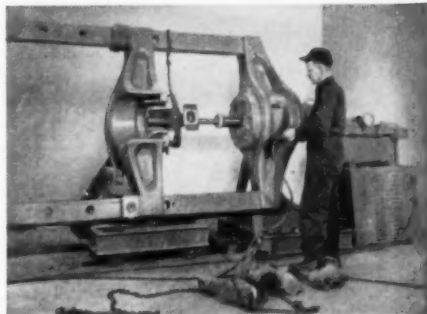
The heavy machines and equipment used in the great iron mining industry present a variety of problems when repair or maintenance is necessary. For this work the accurately controlled action of Rodgers Hydraulic Forcing Presses is a real time and work saver.

A Rodgers Forcing Press puts a mountain of power at your fingertips to force wheels, sprockets or gears from their shafts and for straightening, assembling, swedging or upsetting jobs. Operators also use the versatility, speed, power and positive control of a Rodgers Forcing Press to efficiently perform small pressing and forcing jobs with just a touch of pressure—tasks once done only on vertical shop presses!

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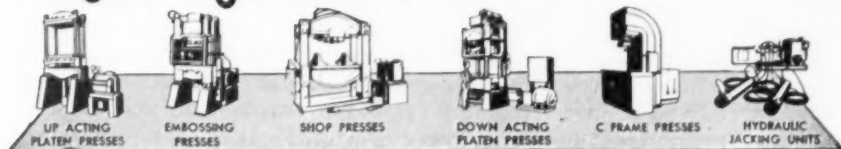
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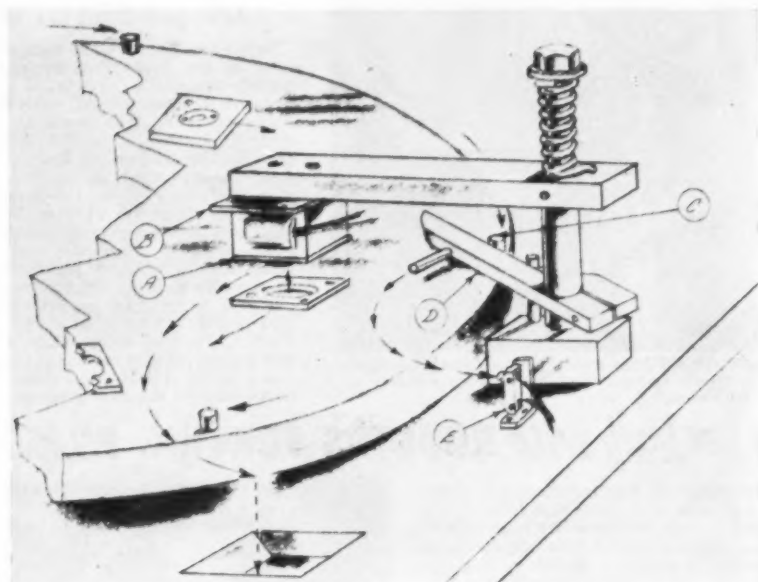
LIGHT TOUCH FOR SMALL JOBS—This Rodgers 300-Ton Inclined Forcing Press is used on small as well as large equipment repairs. Here, a pin is being pressed out of a tractor idler support bracket.

Rodgers Hydraulic Inc.

7453 Walker St., Minneapolis 26, Minn.



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Unloading Attachment for Rotary Fixture

- To facilitate unloading a nested part from a fixture, when air ejection was not adequate, the magnet method was introduced and overcame the problem.

The magnet consists of a continuous duty type solenoid, to which has been attached a piece of phenolic (A) which helps prevent any tendency for the parts to "hang on" the magnet after the circuit has been opened.

The unloading is taking place at the same time that the work cycle is being performed at another station.

As the rotary table indexes under the magnet, (B) which is continuously energized, the parts are attracted straight upward to it. As pin (C) con-

tacts arm (D) the whole assembly pivots in order to clear the fixture. In this position the magnet circuit is held open, as the result of arm (D) opening the normally closed micro-switch, (E) allowing the parts to drop free through the hole in the bench into the tote pan under the bench. . . .

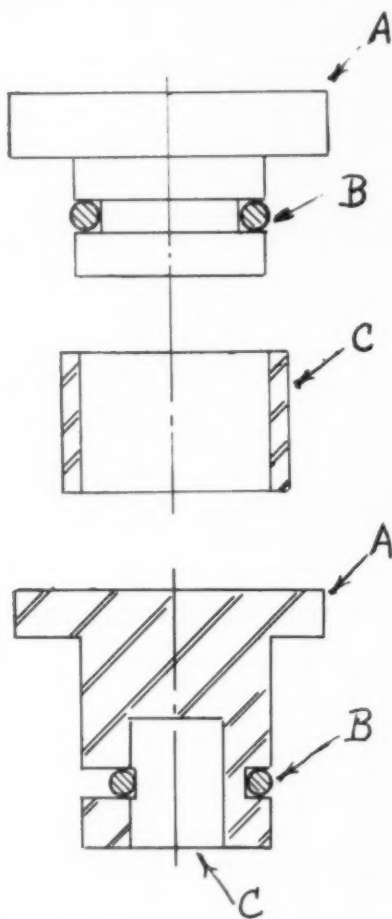
Some Good Uses for Your Outdated "O" Rings

By Wm. E. Demarest

- The accompanying sketches show methods of retaining parts in the punch of a press performing an assembling operation, where the odd-shape of the piece-part makes it difficult to hold.

Top sketch shows the use of some

of the various standard size "O" rings to provide the "holding by friction" method. Here the piece-part "C" will be held on its inside diameter by an



"O" ring "B" nested in a concentric groove in the punch adapter "A." These rings will stand a lot of tough usage.

Sketch shows another but effective method of holding parts in the punch. In this case, the problem is to hold

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Extra Long, Straight Shank
High Speed Drills

12" OA, 9" FLUTE



SIZE	PRICE	SIZE	PRICE
1/8	1.65	27/64	3.30
9/64	1.75	7/16	3.30
5/32	1.75	29/64	3.60
11/64	1.85	15/32	3.60
3/16	1.85	31/64	3.60
13/64	1.95	1/2	3.60
7/32	1.95	33/64	4.20
15/64	2.05	17/32	4.20
1/4	2.05	35/64	4.50
17/64	2.15	9/16	4.50
9/32	2.15	37/64	4.75
19/64	2.25	19/32	4.75
5/16	2.25	39/64	5.00
21/64	2.50	5/8	5.00
11/32	2.50	21/32	5.40
23/64	2.75	11/16	5.80
25/64	3.05	23/32	6.25
13/32	3.05	3/4	6.75
3/8	2.75		

18" OA, 13 1/2"-14" FLUTE

SIZE	PRICE	SIZE	PRICE
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7/32	4.10	19/32	9.50
1/4	4.10	5/8	10.00
9/32	4.75	41/64	11.00
5/16	4.75	21/32	11.00
11/32	5.25	43/64	12.00
3/8	5.25	11/16	12.00
13/32	6.00	45/64	13.00
7/16	6.00	23/32	13.00
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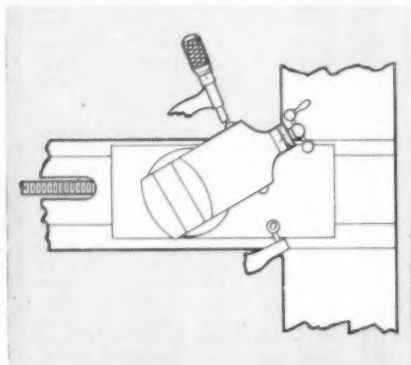
251 CENTRE STREET, DEPT. A

Tel: CAanal 6-5575, New York 13, N.Y.

a ring-type part and it is accomplished by means of an eccentric groove holding an "O" ring and retaining the piece-part on the outside diameter.

This method is used in cases where the piece-part to be assembled is very small and it is impossible to get a cutting tool inside the adapter in order to cut the necessary groove for the "O" ring.

However, if the part to be assembled is large enough, an internal concentric groove may be machined on the adapter to hold the "O" ring. . . .



Quick, Accurate Adjusting of Compound Rest

By Clifford Molloy

• We frequently do lathe work which requires accurate setting of the compound. The compound is graduated in degrees but it takes a long time to set it up to meet precision requirements. The usual procedure is to take a trial cut and correct the setting by tapping the compound. However there is no

way of measuring how far it moves on each tap and it is easy to tap it right past the desired position.

We have added a means of actually measuring the position of the compound by taking a micrometer reading. We then tapped two blind holes on the cross slide. The compound is set at the approximate position and a cap screw is threaded into one of the holes in the cross slide. Two holes are tapped in the cross slide because in certain positions one hole is covered.

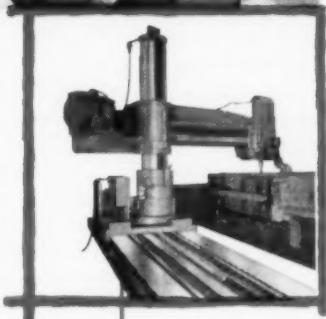
Now as each adjustment of the compound is made a measurement is taken and recorded. These measurements do not of course indicate the actual angular setting but they do serve to show the tool maker how far he has moved the compound each time he adjusts it. If he passes the correct position it makes it easy for him to bring it back. . . .





Specialists do the job better: they're on the ball

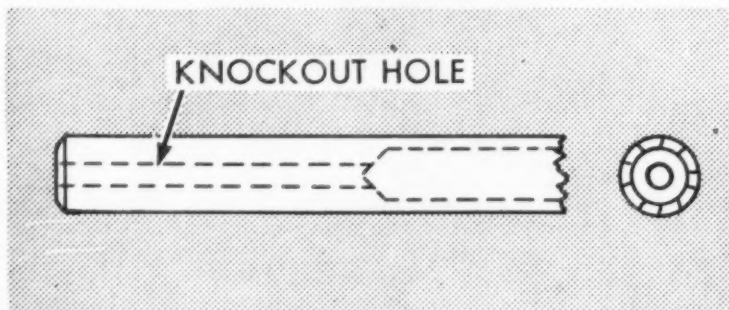
The fellows most on the ball are those who concentrate on one thing . . . and do it well. Carlton has concentrated on radial drill research, engineering and manufacturing since 1916. This close contact with—and intimate knowledge of industry's drilling requirements—has produced a wide line of the most modern and up to date radial drills. Made in arm lengths from 3-ft. to 12-ft., column diameters from 9" to 26". Programming, pre-select, partial pre-select and manual speed-feed controls, plus special bases, tables and jigs available for additional productivity. The Carlton Machine Tool Co., Cincinnati 25, Ohio.



Carlton

SPECIALISTS IN RADIAL DRILLS

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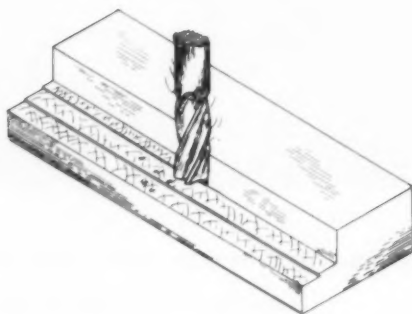
Removing Broken Taps From Blind Holes

by Henry Koslow

- We do a good deal of tapping on castings and other machine parts and like other shops we are frequently faced with the problem of removing broken taps from blind holes.

To remove these taps when the usual methods have failed we use a hollow cutter. We made these cutters from drill rod or sometimes high speed steel. We made one cutter for each size of tap. They are used in the drill press and cut a narrow circular ring around the tap. This thin ring is easily broken away.

We now tap the hole and install a commercial insert made of diamond cross section wire. If permitted we tap the hole to a larger size. If necessary we fill the hole with weld metal and drill and tap it. These tools can be made by milling the teeth or, if desired, the teeth can be filed on. We don't use these often but when needed they are very handy to have. • • •



Longer Life for End Mills

by Clifford Molloy

- End mills are very useful and are widely used. Many of the smaller vertical milling machines do not have sufficient power and rigidity to take a cut equal to the full diameter of the cutter unless the cut is very shallow.

The usual procedure is to take a cut equal to less than half the cutter diameter as shown in the drawing. Dur-

ing each cut, the end cutting teeth rub on the surface that was cut during previous passes.

It is a well known fact that rubbing and scraping without actually producing chips is detrimental to the cutting edges and produces rapid wear. In order to avoid this rubbing we lower the table a few thousandths after each pass. This eliminates the rubbing and produces small steps (shown exaggerated in the

drawing). These steps are readily removed in taking the finish cut because the finish cut is a shallow cut and the full width of the cutter is taken in each cut.

This procedure of using steps is better than taking several shallow cuts the full width of the cutter. Taking narrow deep cuts makes use of a greater length of the cutter and gives longer life.

• • •

THE REVOLUTIONARY CRITERION cut-off tool

now has carbide tipped, as well as high speed steel blades

Greater savings in cutting time, blade replacement costs and power are now possible with this new cut-off tool. The patented construction holds the upper portion of the blade in vertical tension by means of a combination dove-tailed and tapered slot. Because the lower part of the blade is free to slide within a parallel dove-tail slot, it is never under compression—thereby eliminating blade breakage under heavy loads. This novel design makes these tools extremely stable on all parting and grooving operations, eliminates the overhang problem, saves labor, material, reduces tool and spindle wear.



Available in cutting capacities of 1, 3, 4, 6, and 8 inches. Shanks to fit all standard sizes. Heavy duty holders and shanks available.

Check your dealer, or write Dept. MT-5

CRITERION MACHINE WORKS
765 West Sixteenth St., Costa Mesa, California



New GA batch type controlled atmosphere furnace designed for tool rooms and small production. 2 models now ready—others to follow.

Cooley

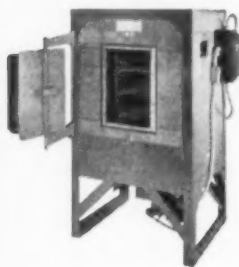
**ELECTRIC HEAT
TREATING FURNACES**

35 Models

WITH AND
WITHOUT

*Controlled
Atmosphere*

ELECTRIC OVENS

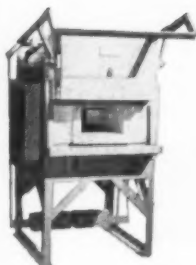


Recirculating Air Draw: box type furnace for controlled heating to 1300° F.—steel tempering, glass annealing, etc. 8 sizes to 24" w. x 15" h. x 48" d.



◀ **Bench Type:** for tools and small parts—to 2000° F. 14 sizes to 10" w. x 8" h. x 18" d.

Recirculating Ovens: for drying, finishing and industrial processing to 600° F. 5 sizes to 36" w. x 36" d. x 60" h. ▶



◀ **High Temperature Box Furnaces:** for high speed steel treating to 2500° F. 3 sizes to 12" w. x 8" h. x 24" d.

Industrial Box Furnace for general heat treating—to 2000° F. 8 sizes to 24" w. x 18" h. x 48" d. ▶



Catalog and complete information on any of these furnaces will be gladly furnished on request.

COOLEY ELECTRIC MANUFACTURING CORPORATION

36 S. SHELBY ST. • INDIANAPOLIS 7, INDIANA

Holds .015-Inch Tolerance on 37-Inch Diameter Fuel Manifolds

• In the production of fuel manifolds for the main burner of the Pratt & Whitney J-57 engine, National-U.S. Radiator Co. jig-brazes 755 separate pieces, using 380 brazes, into an assembly 37 inches in diameter. A tolerance of .015-inch on the diameter of the manifold is maintained.

Tubing for the pig-tails is .3125-inch OD seamless Inconel tubing supplied by Superior Tube Co., Norristown, Pa. to AMS 5580C through the Pittsburgh warehouse of Williams & Co.

Tubing for the ferrules is type 347, a columbium-bearing modification of type 304 stainless steel which prevents carbide precipitation and resultant intergranular corrosion when the Inconel pig-tails are copper brazed to the ferrules before assembly into the manifold.

Both the Inconel and the type 347 tubing are cut to length by National-U.S. Radiator in its Union Machine Shop and are then chamfered and deburred on both ends.

In the production of the ferrules, the cut lengths are first reamed in a drill press to a slight shoulder on one end.

The other end is cut to a 45-degree angle using a Do-All saw, with a few being cut to a 35-degree angle. Tolerance on the angle is held to plus or minus two degrees. The cut angle is then deburred.

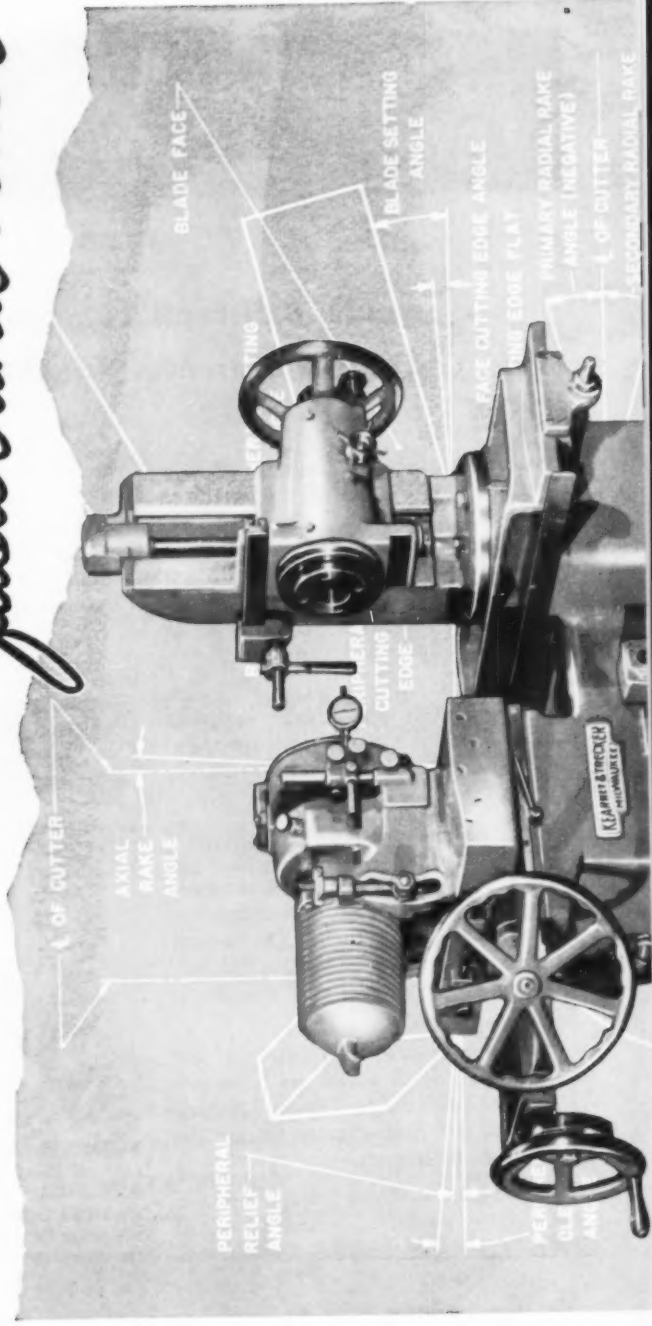
When the assembly is ready to braze,



1. FERRULES. One end of the ferrule is cut at an angle as shown to distribute stresses when fuel manifold is put into service. The Inconel pig-tails are brazed to the ferrule, using copper rings which slip inside the ferrule and stop at the shoulder on the square end.

ESPECIALLY DESIGNED TO...
SHARPEN CARBIDE FACE MILL CUTTERS

faster and better



NEVER GRIND CHAMFER AS
SINCE USUALLY THE

BRIEF SPECIFICATIONS

Grinding wheel spindle range:	5½"
Longitudinal slide movement:	11"
Cross slide movement:	11"
Cutter spindle range:	No. 50
National Standard Spindle End	13"
Cross slide movement:	13½"
Vertical slide movement:	13½"
Cutter upright swivels:	360°
Grinding wheel spindle drive motor:	1 hp

EVERY important feature you need for low-cost, efficient sharpening of carbide and H.S.S. face mill cutters are built into these Kearney & Trecker heavy-duty precision Cutter Grinders.

Handily located controls simplify operation.

Graduated dials facilitate setups. Spindle flywheel helps maintain 3400 rpm constant speed during grinding. A jeweled-bearing dial indicator is furnished for checking finished cutter accuracy.

Three-inch to 7" dia. face mills attach to style "C" arbors and mount on the cutter spindle head. Cutters 8" to 24" dia. bolt directly to spindle nose.

Write for Bulletin G-10, Kearney & Trecker Corp., 6796 W. National Avenue, Milwaukee 14, Wisconsin.



FACE MILL

CUTTER GRINDERS

*handle all types of face mill
cutters up to 24" in diameter.
Accurate to 0.0002"*

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**Designers and Builders of Precision and
Production Machine Tools Since 1898**



Field Reports

continued

a copper ring is inserted into the ferrule and stops at the reamed shoulder. The ferrule is then slipped over the Inconel pig-tail, holding the copper ring against the shoulder, and the assembly is brazed.

Cutting the one end of the ferrule at an angle distributes stresses and greatly minimizes the possibility of a fracture.

The Inconel tubing is bent into a pig-tail to absorb vibration and prevent fracture. It is cut into 12-inch lengths, plus or minus .020-inch on the length, and is then bent to the pig-tail configuration. The bent tubes are inspected for both contour and diameter in a fixture developed from a master tube.

The stainless steel brazing fixture, in which the parts are rigidly clamped before brazing, weighs 1400 pounds and is machined as accurately as the parts themselves. . . .



2. MACHINING FERRULES. In the production of ferrules, the ends of the cut tubes are chamfered and deburred and the bore is reamed to a slight shoulder on one end, using turret lathes such as this. Later the tubes are cut to an angle on one end with a Do-All saw.



3. TUBE BENDER. After Inconel tubing is cut to length, chamfered and deburred, it is bent to shape in a series of fixtures such as this. Tubing is soft annealed to facilitate bending and minimize possibility of cracks forming in bent tubing.



4. CONTOUR CHECK. This fixture checks the bent Inconel tubing for both contour and diameter. Diameter tolerances are maintained within plus or minus .002-inch. Used for fuel intake, six of these fuel bodies are assembled into a single cluster.

High Production Honing
with Real Flexibility

The New
**SUPERIOR
VERTICAL HONING
MACHINE**

Capacity up to 4-inch diameter and 12-inch height. Spindle speed infinitely variable 225 to 550 rpm. Jogging switches permit working in any section of the part without resetting the stroking limit switches. Honing cycle electronic timer controlled 6 to 120 seconds. Driving head hydraulically controlled for stroking and constant stone expansion pressure. 4-way adjustable ground table. Integrally sealed driving head spindle bearings.



For complete details and prices on this and other Superior Honing machines, use coupon.

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Please send details and prices on Vertical Honing Machine.

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Unique Drill Head Ups Production 2½ Times

MILWAUKEE—Drilling 5/32" holes ⅜" deep, in tough forged rivets is a requirement in the production operations of the Bradley Washfountain Company.

Former methods produced only 125 pieces per hour with very high drill breakage due to the hard stringy metal. How to reduce drill breakage and increase production was an ever present problem with this manufacturer.

In an attempt to solve it, a special automatic drill unit, with all operating and control mechanisms built-in, was set in place of the standard head on the drill press regularly used for this work. A cycle timer and unloading

chute were added to complete the new setup. Note the special mounting bracket, an accessory supplied by the manufacturer, used to secure the new drill head to the standard drill press column. Because more accurately controlled precision feeds and speeds are possible with this new drill head, these production results were achieved:

1. No drill breakage.
2. 333 pieces per hour—2½ times former production.
3. Lower unit cost.

This drill head is a completely new and different production tool. It is the Dumore Automatic Drill Unit, Series 24, designed for single or multiple operations where versatility and flexibility are necessary to meet the varying conditions and frequent changeovers of diversified manufacturing. In this case, it proved its worth on one set-up. When desired, it can be moved quickly and easily to numerous other operations with minimum time loss.

Produced by The Dumore Company, Racine, Wisconsin, this tool is available as complete drill press with table fixture, press and unit, or, unit supplied with brackets to convert a 14" x 17" drill press to a completely automatic drilling machine. • • •

Tests show new applications for chromium carbide

PITTSBURGH, Pa.—A large Mid-Western manufacturing concern needed a material that would withstand the destructive effects of a high temperature (1600°-2000° F.) reducing (ammonia) atmosphere for long periods of time.

After reviewing all aspects of this particular manufacturing situation, Firth Sterling engineers recommended the use of Grade CR-2 chromium carbide, based on previous success using this material as inserts for hot extrusion dies.

The preliminary test run on CR-2 was so satisfactory that this manufacturer ordered a large quantity of shafts, bearings and other parts for use in this equipment.

For eight months, these parts were used continuously at 2000° F. five days each week and idled at 1600° F. the remaining two days. At the end of this period, when the equipment was shut down for repairs, the CR-2 parts were examined. 90 of the 120 parts were still serviceable, while only 30 had to be replaced due to warpage caused by distortion of the support members.

A laboratory examination of one of

these used parts resulted in the following reports:

"There appears to be comparatively small damage to the material when one considers the length of their service at 2000° F. The used sample meets the physical characteristics and porosity standard for this grade."

Further study of the used parts revealed that continued service at these high temperatures and corrosive atmospheres had not caused any breakdown of the bearing surface, and that the fit of the shafts in the bearings was essentially the same as when these parts were placed in service.

These very successful trial and production runs of CR-2 chromium carbide parts under severe high temperature and corrosive conditions open a vast new range of applications in the chemical, petroleum, and metalworking industries. . . .



Actual overall length horizontal models: 3 1/2", 5", 6".

"ADJUSTABLE STROKE" MIDGET

Air-Clamp
CYLINDER
TRADEMARK

Now — put pressure where it's wanted instantly and cheaply, with Mead's powerful new midget air cylinders (1" bore, single-acting, spring return — horizontal and vertical). Stroke is adjustable. Cut costs — use 'em singly or in groups to move, hold, press or eject small work pieces; to close and open large jigs, forms, fixtures. They'll replace human fingers and mechanical clamps in countless routine jobs.

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PATHFINDER IN AIR POWER AUTOMATION



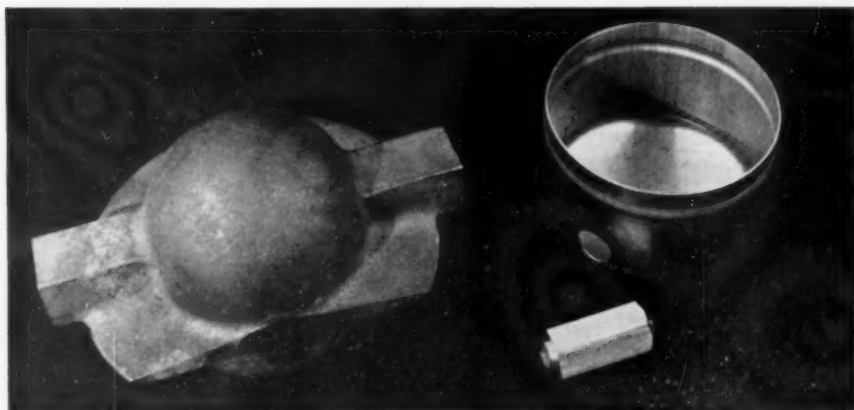
Cutting Steel at 16,454 SFPM

CLEVELAND — An unofficial world record of 16,454 sfm. cutting speed on steel has been established with ceramic tooling on this specially designed turret lathe. This was a metal cutting research project conducted for the Warner & Swasey Company, under contract, by the industrial engineering research laboratory of The Ohio State University, Columbus.

The new record was set cutting a 13" diameter blank of 1040 steel approximately 3½" in length, using a feed of .011" per rev. and a cutting depth of .040". The workpiece was bolted to the machine spindle and supported still

further by a center mounted on the lathe's hex turret. A mechanically clamped holder was used for the small ceramic cutting tip. Power for the lathe was supplied by a heavy-duty DC motor coupled directly to the spindle through step-up gearing.

While conducted strictly as a laboratory experiment, Warner & Swasey points out that this test is a graphic demonstration of the potential of ceramic tool materials in high speed metal cutting! As might be expected, however, cutter life was extremely short, allowing completion of only one cut per tool edge. • • •



Courtesy Armco Steel Corporation.

From Cast Iron to Stainless . . .

Cuts costs 60c a part; reduces weight 90%

- An oil burner manufacturer had been using cast iron for vaporizer cups. Tool grinding and replacement costs were excessive and service problems were many.

When he switched to Type 304 stainless steel, this is what happened:

- He saved 60½ cents on each part—35 per cent on materials and labor alone.

- He virtually eliminated service failures.

- Reduced weight of each part 90 percent. (The cast iron cup weighed 5 pounds; the stainless steel cup ½-pound.)

- The "burn-out" problem was solved.

Fabrication consisted of drawing the

stainless cup, welding a machined stainless steel spud to the drawn cup, and punching and beading. • • •

Comparison of Costs

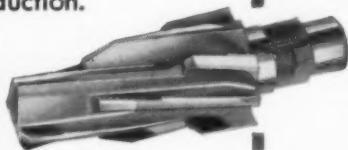
Cast Iron Cup	
Cost of casting	\$1.090
Machining	
grinding, boring, drilling,	
tapping	0.274
Total	\$1.364
Stainless Steel Cup	
Cup material	\$0.330
Spud material	0.100
Drawing	0.119
Welding	0.200
Punching, beading cup and	
machining spud	0.132
Total (Material and Labor)	\$0.881

FINE CUTTING TOOLS

by *Eclipse*

Since 1913 Eclipse has been consistently and conscientiously serving many companies in widely diversified fields of production.

Each of these companies has found that "Engineered by Eclipse" is assurance of genuine quality in end cutting tools.

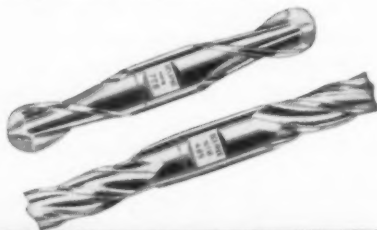


- High Speed Steel Cutters
- Carbide Tipped Cutters
- Core Drills
- Inserted Blade Cutters
- Multi-Diameters
- Back Spotfacers

and remember . . .

Eclipse now has a complete line of Precision End Mills. Ground from the solid, Eclipse End Mills insure longer tool life, finer finishes and lower production costs.

- Write for Counterbore Cat. No. 51
- Write for End Mill Cat. No. 56



ECLIPSE COUNTERBORE COMPANY

DETROIT 20, MICHIGAN

END MILL DIVISION—NORTH BRANCH, N. J.

ADDRESS
(BOX 97, RARITAN N. J.)

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Arrow Moves to New Plant



Arrow Tool and Reamer Co. has moved into its new building at 711 Stephenson Highway, Troy, Mich. The plant provides modern facilities for the design and manufacture of high speed

and carbide cutting tools.

The manufacture of the Fascut line of standard cutting tools will continue at the Fascut Tool Co., Charlotte, Mich.

Hans Ernst receives ASTE Research Medal

Hans Ernst, director of research for the Cincinnati Milling Machine Co., was presented with the Research Medal by the American Society of Tool Engineers at their national awards dinner, March 23, Houston. This medal was instituted to honor research engineers for "significant published research leading to a better understanding of materials, facilities, principles and operation, and their application to better manufacturing." The award was a fit-



ting recognition for Ernst's 31 years in research and development work at Cincinnati Milling, during which time over 100 patents have been issued in his name.

Lamson & Sessions to produce Nylok fasteners

The Nylok Corp., Paramus, N. J., has licensed Lamson & Sessions Co., Cleveland, to produce its line of self-locking screws and bolts.

The process involves inserting a nylon plug into a hole drilled in the threaded area of the fastener. L&S, supplier of nuts, screws and bolts, has made arrangements for special Nylok-designed machinery for the operation. They will start production in their main plant at Cleveland.

Hydraulics division formed

Continuing a program of decentralization, another operating division has been added to Vickers Inc., Detroit. Each division includes related groups of products. Each has its own engineering, manufacturing, marketing and service facilities. This move has been made desirable by the growth of the business and the addition of new product lines and plants.

The new machinery hydraulics division will have **M. A. Hayden** as gen-



Merrill A. Hayden



W. F. Driver

eral manager and **W. F. Driver** as general sales manager. This division will take responsibility for all hydraulic components and systems for metal cutting, forming and welding equipment, plastic molding and die casting machines, textile, lumber and mining machinery, marine and ordnance.

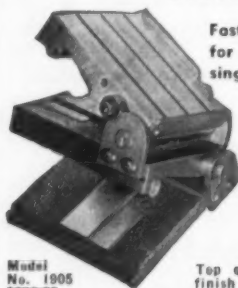
Mathieson Chemical buys Southern Electrical

Olin Mathieson Chemical Corp. has purchased the assets of Southern Electrical Corp., Chattanooga, Tenn., a manufacturer of aluminum wire and cable. Assets of Southern Electrical, which has an annual sales volume of approximately \$15,000,000, are to be obtained in exchange for Olin Mathieson stock. The company will be operated as a part of Olin Mathieson's aluminum division.

A major construction program was begun last year to make Olin Mathie-

NEW

compound angle SINE PLATE



Model No. 1905 \$320.00

Fast, accurate set-ups for compound or single angles.

- .0002" recesses for small angles
- Heavy duty fences
- T slots for clamping
- Lock on each axis
- Solid oak case

Top quality material & finish

Accurate to .0002" in dimensions and parallelism. Roll diameters $\pm .0001"$. Top plate $6\frac{1}{4}" \times 6\frac{1}{4}"$, base $7" \times 8"$. Positive locks hold unit rigid. A high quality compound angle sine plate at LOW COST. Write for literature and prices. Order from your dealer or direct.

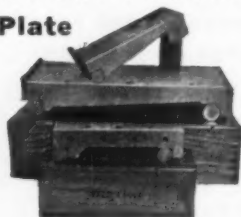


Bald Eagle Corp.

(Formerly Bald Eagle Tool Co.)
356 Cedar St. • St. Paul 1, Minn.

ACCURATE—LOW COST SINE BARS and PLATES

5" Sine Plate
only
\$37.50



Sine Plates and Bars

- Guaranteed Accuracy
- Precision Ground
- Hardened Rails
- Double Normalized
- Tapped Hole
- End Plates
- Solid Oak Case Extra
- Immediate Shipment

No.	Cent. Dist.	Width	Price	With Oak Case
1605	5"	3"	37.50	43.00
1610	10"	5"	87.50	95.00
1705	5"	1"	21.75	25.25
1606	5"	6"	76.00	82.00

FOB St. Paul

Accurate to .0002" in center distance and parallelism for the length of the tool. Order from your dealer or direct

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son one of the nation's four major producers in the aluminum industry. The program includes an investment of \$70,000,000 for the construction of new fabricating facilities, and a joint investment with Revere Copper & Brass Inc. of \$230,000,000 for the construction of facilities to produce the primary aluminum. There will be no changes in Southern Electrical's personnel, agents, distributors, manufacturing or sales policies.

Expansion program at Borg-Warner

Borg-Warner Corp., Chicago, plans to invest \$26,000,000 in new plants and modern equipment this year. This total, one of the largest annual appropriations in company history, will boost to nearly \$186,000,000 the amount of capital expenditures made by the company since World War II.

The largest single disbursement, about



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**FIRMLY
BUT GENTLY**

WITH WOODWORTH CHUCKING EQUIPMENT

Our tough looking character who is holding the smiling baby clearly demonstrates one fact: whenever you are holding anything it should be secured with gentle firmness. And this is so true when considering chucking equipment.

Your best machine will produce only as accurately as its work-holding device permits and Woodworth manufactures the most rugged, accurate and dependable chucks for precision machining in America.

We invite your inspection and consideration of N. A. Woodworth products. There is a Woodworth Sales Representative in your area and a letter to the N. A. Woodworth Company will place him promptly at your service.

WOODWORTH
1300 EAST NINE MILE ROAD
DETROIT 20, MICHIGAN

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\$6,500,000, will be spent to complete the new \$10,000,000 chemical plant of the corporation's Marbon Chemical Div. in Washington, W. Va. This project is being built on a 322-acre Ohio River-front site and will go into production this spring. It will manufacture a hard, tough plastic called Cylolac.

Another \$5,000,000 to \$6,000,000 has been earmarked for additions and improvements to Borg-Warner facilities in the Chicago area. The balance of the funds will provide for sizable allo-

cations to the York, Norge, Warner Gear, and Byron Jackson Divisions and for a proposed new factory for the Warner Automotive Parts Division at Auburn, Ind.

Morgan becomes advisor

Having completed a five year association with Cone Automatic Machine Co. Inc., Windsor, Vt., as a consulting engineer, carbide tool development, **Claude R. Morgan** is now operating in an advisory capacity under his own



STOPS PIPE THREAD LEAKS

**Satisfaction Guaranteed Or
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TRU-SEAL Fittings are guaranteed to seal pipe thread connections permanently against all oils, practically all known chemicals and gases; to seal under high pressures or vacuum; to withstand —280° to plus 500° F.; to eliminate "overtightening" damage and pipe dope. Available in 1/8" to 2 1/2" pipe thread sizes.

\$10.00 Trial Offer No. 1: eight 1/8", ten 1/4", eight 3/8", ten 1/2" pipe thread **TRU-SEAL** Fittings.

\$10.00 Trial Offer No. 2: eight 1/2", ten 3/4", four 1" pipe thread **TRU-SEAL** Fittings.

Send order to

TRU-SEAL DIVISION
Flick-Ready Corporation

2026 N. Hawthorne, Melrose Park, Ill.

*"Miller Fluid Power" is also a Div. of Flick-Ready Corp.



Thread **1**

TRU-SEAL on pipe or fitting (no messy pipe "dope" needed).

SEAL SIDE



Thread pipe **2**

or fitting 4 threads into port. Point in desired direction.



Tighten **3**

TRU-SEAL to complete leakproof assembly (only light torque required).



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name at Pittsfield, Mass. His new work is among automatic and other cutting machine users, and includes high speed steel tools as well as carbide.

Research center enlarged


Ground has been broken for the expansion of the Babcock & Wilcox Company's research center at Alliance, Ohio. An L-shaped building containing 15,700 sq. ft. of floor area will be erected at the Center for nuclear engineering

research activities. A two-bay addition will be made to the mezzanine of an existing structure to provide office space for product development personnel.

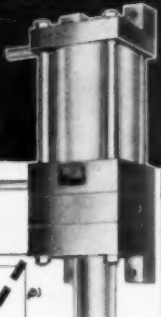
Dumore buys Versa-Mil

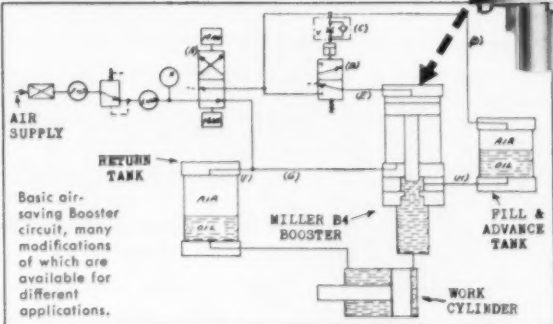
Purchase of the manufacturing and sales rights for the Versa-Mil has been announced by the Dumore Co., Racine, Wis. The machine is an attachment for lathes and other machine tools. Pri-

Up To
10,000 psi Oil
from Shop Air



**AIR-HYDRAULIC
BOOSTERS**






Basic air-saving Booster circuit, many modifications of which are available for different applications.

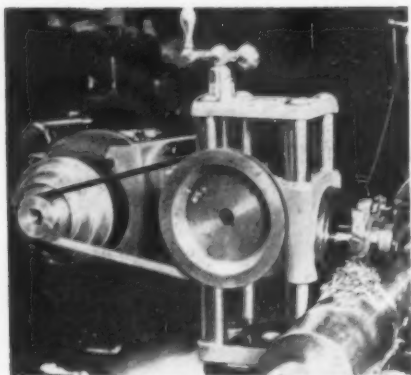
No Pumps or High Pressure Valving Needed

Hook a Miller Air-Hydraulic Booster to your air line and get **INTENSIFIED** hydraulic power that you can vary and control at will and use for such common shop operations as punching, clamping, pressing, riveting, shearing, welding, crimping, testing, etc. Boosters save air, space, weight, require little or no maintenance and hold pressure as long as desired without additional power consumption. **Models for immediate delivery.**

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Full Details**



FLUID POWER DIVISION
 Flick Reedy Corp.
 2026 N. Hawthorne Melrose Park, Ill.



marily used for milling, it will also drill, bore, cut interval keyways and grind both internally and externally by adding various interchangeable accessories.

Manufacture, sales and service will be handled from the Dumore Co. The attachment will be sold as the Dumore Versa-Mil.

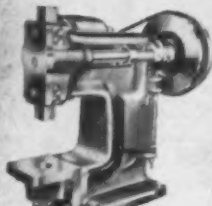
New plant for Productive Tool Service

Productive Tool Service, Inc., has a new building at 27022 Knickerbocker Rd., Bay Village, Ohio (a Cleveland suburb). Various types of cutting tools, both high speed steel and carbide, are manufactured here. A sharpening and regrinding service is also maintained.

NSMPA members tour Europe

A National Screw Machine Products Assoc. group left April 27 for Europe and a five weeks factory study tour of screw products facilities in seven countries.

The business itinerary includes the Index and Traub machine tool factories in Stuttgart, Germany, screw machine product factories in Frankfort and Dusseldorf, Germany, and a meeting with



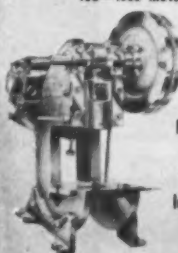
Model B-2-A
2 ton half press
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Heavy Duty Bench Type

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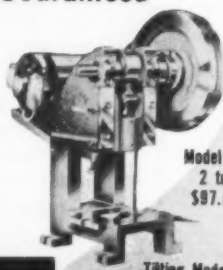
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Dependable and Economical
Fully Guaranteed*



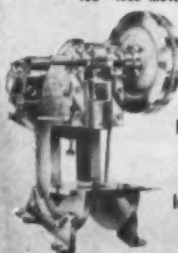
Special Duty 1 ton
Model LTX—\$89.50
fob—less motor

Many Popular Models
1 to 5 ton capacities
Moderate in price

See Your Supply Dealer
or write for **FREE** punch
press catalog giving complete
information, specifications and
prices on our complete line of
bench type punch presses.



Model B-2
2 ton
\$97.50



Model B-5
5 ton
\$199.50
fob
less motor

ALVA ALLEN INDUSTRIES
Dept. MTB Clinton, Missouri

Tilting Model
\$127.50
less motor—fob

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the West German Screw Products Assoc. in Dusseldorf.

In England, the group will tour M.C.L. Co. and Repetition Ltd., of

Birmingham, Collinson's Precision Screw Co. and Anglo-Swiss Screw Co., Ltd., London, and will hold a meeting with that nation's screw products association.

Turchan Follower Moves



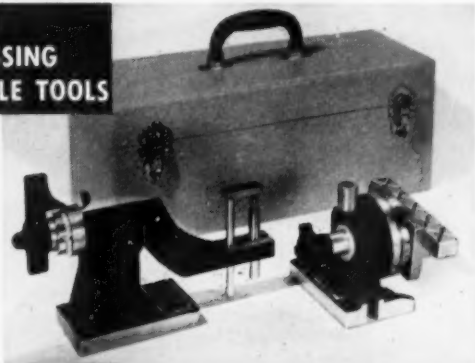
Turchan Follower Machine Co., formerly of Detroit, has moved into its new Building at 26950 Van Born Rd., Inkster, Mich. The new plant provides 20,000 square feet of floor space to accommodate increased engineering, ex-

perimental and manufacturing facilities. An area devoted entirely to demonstrations of tracer controlled attachments for machine tools is also provided in the building.

Now ANGLE TANGENT TO RADIUS WHEEL DRESSING WITH NEW VERSATILE TOOLS

**MIGHTY GOOD AT ANY PRICE
BUT TOPS AT ONLY \$149.50**
(Both tools including diamonds)

The G-5 RADIUS DRESSER is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on a 7 inch or 10 inch wheel, and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. The G-2 ANGLE DRESSER AND TOOL HOLDER is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1"; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc., on any desired angle.



Our fixtures will dress most radii and angles tangent to each other, similar to those shown below.

FREE handsome, wooden storage box.
Write for complete information.

Distributorship available in select territories.

ROTHFUSS TOOL

COMPANY

BOX 22, ELMWOOD STATION

PROVIDENCE 7, R. I.



The Metal Products Div. of Dayton Rogers, Minneapolis, is housed in a new plant having a floor space area of about 30,000 sq. ft. It is equipped with the latest machine tools. The company's pneumatic die cushions are primarily built here, but contract machining is also carried on.

Talide®



ROLLS



DIES



TOOLS



BLADES



BAR STOCK



HEAVY METAL

HARDEST MAN-MADE METAL!

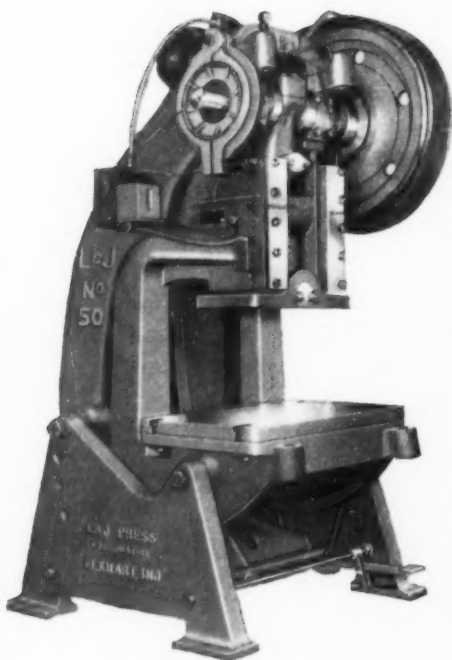
● New, improved TALIDE METAL is uniform in quality—gives top performance on ALL cutting, drawing and wear-resistant applications. Write for Catalog 56-G. METAL CARBIDES CORP., Youngstown 12, Ohio.




HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

L&J 50

SERIES



Write for Bulletin L-14

14 to 90 ton O.B.I. Presses, 20 to 50 ton Straight Side Presses.

EXTRA CAPACITY WITH PRECISION TO MATCH

Large area dies are no problem when you have an L&J No. 50 Series press with its extra capacity. The exceptionally heavy frame provides maximum rigidity which enables the flanged, box-type ram to maintain precision alignment for precision jobs. The large work area will permit you to run a greater variety of work. Its dependability and tooling ease provide a new high in press efficiency.

Available in geared and non-geared models. Air clutch is available. It will pay you to get complete details now.

SPECIFICATIONS

Capacity: Model 50—50 tons, Model 50B—56 tons. **Shut Height:** 10" to 25". **Ram Stroke:** 3" to 8". **Ram Adjustment:** 3". **Ram Face:** 24" x 12". **Bolster Plate:** 36" x 24" x 2 1/4". **Throat Depth:** 12 1/2". **Opening Thru Back:** 22". **Speed:** Model 50 Non-geared—100 S.P.M., Geared—50 S.P.M. Model 50B Non-geared—95 S.P.M. Geared—46 S.P.M. *Higher speeds with air clutch.*

L&J PRESS CORPORATION

1625 STERLING AVENUE, ELKHART, INDIANA



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Johnson's major contribution to coolants fits today's high-speed production needs!

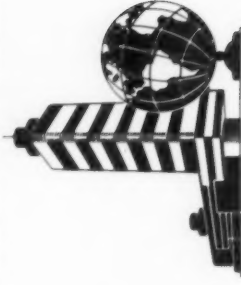
Coolants were just coolants for 50 years until Johnson's Wax Research developed formulations using *waxes* and *wax-type synthetics*. Johnson's Metalworking Fluids are as modern and efficient as your 1957 machine tools. They give you superior performance even on your toughest jobs — because Johnson's lubricates and cools under conditions where ordinary coolants fail because of extreme heat and pressure.

Use Johnson's on your fastest machines, with your hardest-to-machine

metals, and compare results obtained with conventional coolants. In hundreds of shops across the country, Johnson's coolants for machining, cutting and grinding are reducing costs and increasing profits.

Your local Johnson's industrial distributor will be glad to set up an in-your-shop test of TL-131 — or any of the complete line of Johnson's Metalworking Fluids. Ask him about Johnson's money-back *Guarantee of Superior Performance* over ordinary coolants.

from
Johnson's Wax Research



"Johnson's" is a trademark of S. C. Johnson & Son, Inc.

S. C. Johnson & Son, Inc., Industrial Products Division, Dept. D-57, Racine, Wisconsin

Pictured below is Johnson's TL-131, one of a complete line of modern coolants for today's high-speed grinding.





Always on the Job!

CHOOSE
"RFC"

**AUTOMATIC FEEDS
for
POWER PRESSES**

- Maintains Original Setting Regardless of Wear.
- No Ratchets or Pawls To Wear Down and Throw Off Feed Spacing
- Feeds in Thousandths —Amazingly Accurate.
- Trouble-Free Clutch . . . Fewer Parts in Clutch Mechanism.
- Reverses Instantly.

**MANUFACTURERS OF QUALITY
FEEDS FOR POWER PRESSES**

**WRITE FOR
LITERATURE**



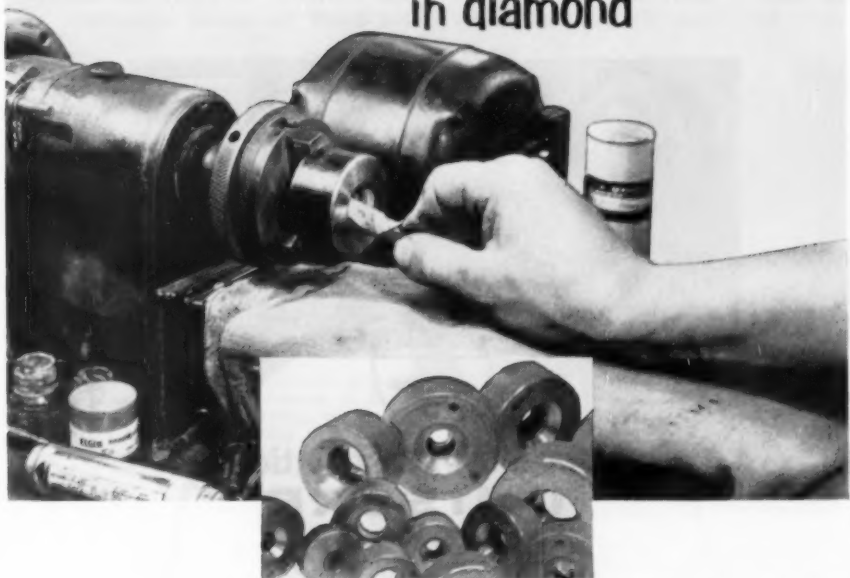
Roll Feeds Corp.

ASHTON, R. I.

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MACHINE and TOOL BLUE BOOK

there
is a
difference
in diamond



...the difference is
ELGIN

Only ELGIN controls all of the vital quality factors that add up to the big difference in diamond abrasives—and give you complete assurance of predictable finishing results. Make your own comparison—look for:

1. Purity of diamond.
2. Cubical particle shape for efficient cutting action.
3. Rounded particles, the sign of reclaimed diamond.
4. Non-working "fines" or dangerous oversize particles.
5. Consistency. Check an old sample against a new one.
6. Particle size distribution within Bureau of Standards limits.

You'll see the big difference in diamond, quickly, right in your own laboratory. Or ask your Elgin man to bring in a microscope. And once you've seen for yourself, you'll insist on ELGIN Diamond. The big difference in diamond will mean a big saving in your finishing costs!

Abrasives Division



ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS Dept. K

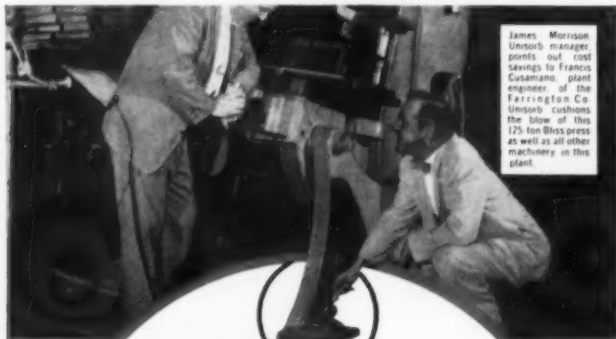
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Motch & Merryweather, Avey Drilling Merge

The merger of the Motch & Merryweather Machinery Co., of Cleveland, and the Avey Drilling Machine Co., of Cincinnati, has been announced. The latter is a well-known producer of special transfer and indexing machines, drilling, reaming and tapping equipment. Motch & Merryweather, which has been a distributor for Avey for nearly fifty years, is a leading builder

of special automatic transfer machines, cut-off saws, saw blades and saw blade grinding machines.

Under the new agreement the Avey Co. will henceforth be known as the Avey Division of Motch & Merryweather and will operate as a separate unit, retaining its present facilities, management and personnel. The Cleveland plants of Motch & Merryweather will provide substantially increased total facilities, especially for assembly and heavy machining operations.



James Morrison, Unisorb manager, points out cost savings to Francis Cotnam, plant engineer of the Farrington Co. Unisorb cushions the blow of this 175-ton Bliss press as well as all other machinery in this plant.

Save up to 30% on Machinery Installation with **UNISORB**

You can save three ways by using Unisorb . . .

- Installation costs are cut up to 30%
- 80% saving in time
- No floor drilling, no bolts or lag screws

Plus . . .

Vibration is reduced up to 85%, machines work better, last longer. And, they can be moved anywhere, anytime.

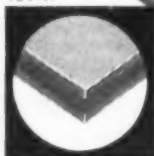
Unisorb is impervious to oil and cleaning solutions. Permanent alignment, no "walking," precision shimming.

Send for **FREE Sample and Facts Book**—

See how others have used Unisorb to save time and money. Use reader service card, write or call:



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The FELTS Company
219 SOUTH STREET, BOSTON 11, MASS.

Manufacturers of Felt and Felt Products
OFFICES: New York, Philadelphia, Chicago, Detroit, St. Louis
SALES REPRESENTATIVE: San Francisco
Representatives in principal cities throughout the world

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he **HAD**
to use a
sanding block!

but **YOU** can use a Buckeye Air Tool!

There was a time when muscle power—and plenty of it—was needed to finish off a smooth surface. Today, air power, directed through a Buckeye tool, has replaced muscle power. The work gets done faster, naturally . . . and better, of course.

We don't imagine you're still using a wood block and emery cloth, but it's just possible you're not using a modern Buckeye air tool. And that's the only way you can be sure you're doing your finishing work the best and most economical way.

Our Catalog A-10 contains complete information on the entire line of Buckeye abrasive tools, all of it both interesting and helpful to all portable tool users. If you don't have a copy, send us your name, company and address and we'll correct that situation promptly.



Why AIR Tools?

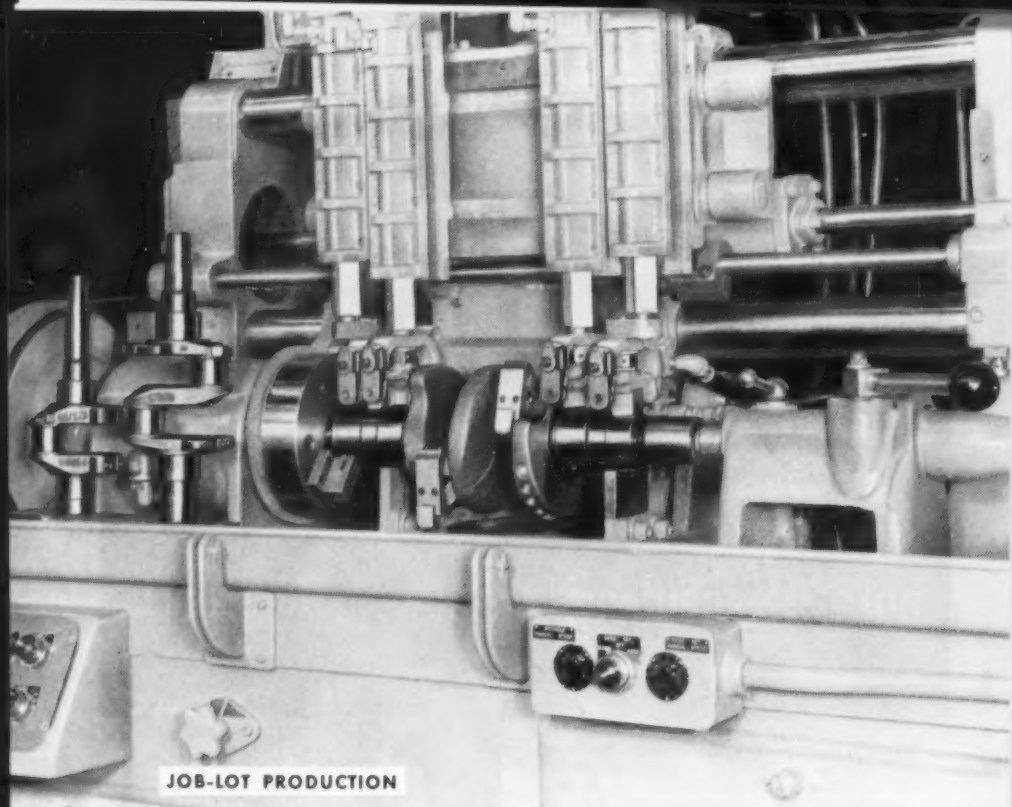
Because air is everywhere, just waiting to be put to work . . . because continuous operation can't possibly harm an air tool . . . and because, using Buckeye air tools, you can almost forget about tool maintenance.

In Air Tools,
Your Best Buy Is Buckeye

Buckeye Tools
CORPORATION

DIVISION 14 • DAYTON 1, OHIO

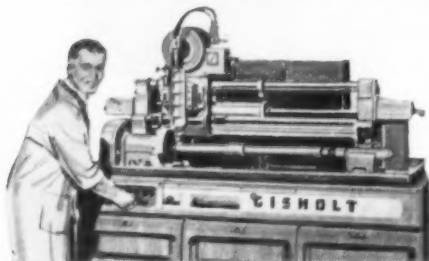
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No. 51A General Purpose Superfinisher

CRANKSHAFTS in small job-lots are Superfinished with this setup—holding the piece between centers and driving from a keyway with a faceplate driver. Latch-on follower-type arms Superfinish the crank pins, while the main bearing and oil seal surfaces are Superfinished by standard overhead quills. Main and pin bearings are taken from a ground surface of 30 micro-inches down to 8 or less. Oil seal surfaces on shaft ends are Superfinished to 4 or less. Production: 44 to 53 pieces per hour at 80% efficiency.

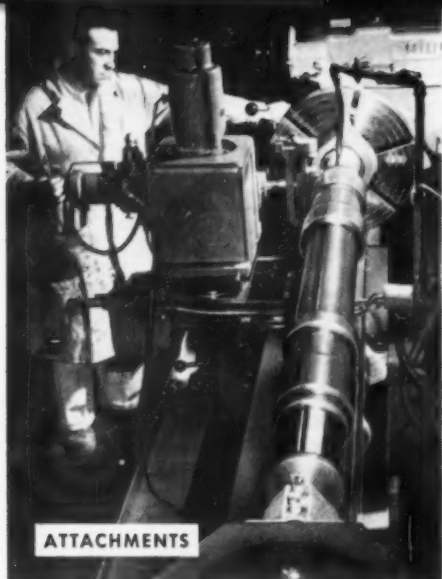
NEED SMOOTHER SURFACES AT LOW COST? See the



BEEEN LOOKING FOR AN INEXPENSIVE PROCESS to improve product quality—to help market your product easier against increasing competition?

Gisholt Superfinishing may well be your answer ...it has been for some time for a long list of leading manufacturers.

With this modern process, you'll definitely reduce—or even eliminate—the cost and time of grinding, polishing or buffing operations. With the exclusive Gisholt Superfinishing method, you utilize a "scrubbing" effect through an abrasive stone which oscillates as the work rotates. Chatter marks, grind-



ATTACHMENTS

No. 4 Superfinisher Attachment

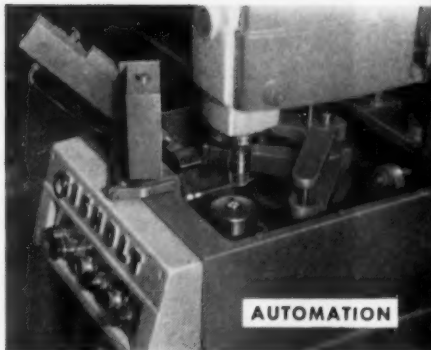
AXLE JOURNALS for railroad switchers are Superfinished with No. 4 Attachment on Gisholt Saddle Type Turret Lathe in this operation. In three steps, lathe finish of 200-250 micro-inches RMS is reduced to final surface finish of 8-10 RMS, removing .004" to .005" stock to eliminate tool marks. Through Superfinishing, 25 switchers logged 30,000 trouble-free hours on journals in first few months.



Superfinished tappet with .005-inch crowned top.

No. 81 High Production Superfinisher

CAST IRON VALVE TAPPETS are Superfinished in long runs on this job, featuring fully automatic handling with a work transfer device. Cup-shaped stones are used, Superfinishing from flat ground surface down to 5 micro-inches RMS or less—and rotating off center to generate .005" crown on the cam end of each tappet. In only 16 seconds floor-to-floor time per piece, the valve tappets are economically Superfinished for longer wear life and better product quality.



AUTOMATION

NEW GISHOLT MASTERLINE SUPERFINISHERS

ing flats, and amorphous "smear" metal left by grinding are completely removed. The true base metal is exposed—providing longer wear and better performance from your product.

Better still, most Superfinishing jobs are done in a fast, automatic cycle—producing very low micro-inch surface readings in the shortest possible time.

The jobs shown here are typical examples where Superfinishing solved production problems and improved product quality. Ask your Gisholt Representative to tell you about them—and many more—in full detail. Call him today!

WRITE TODAY for 30-page illustrated booklet "Superfinishers," explaining Gisholt Superfinishing process in interesting detail.



GISHOLT

MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

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Appointments and Promotions

Changes in Executive and Production Personnel

Name	Company	To	Position
Frank M. Ryan	Norton Behr-Manning Overseas, Inc.	Same	Vice Pres., Foreign Plant Management, Export Sales Norton Products
Dr. Wilfred F. L. Plase	Behr-Manning de France	Norton Behr-Manning Overseas, Inc.	Vice Pres., Foreign Plant Management, Export Sales, Behr-Manning Products
John R. Allison	Norton Behr-Manning Overseas, Inc.	Same	Treasurer
Harold C. Miller	Armour Research Foundation Chicago, Ill.	Super-Cut, Inc. Chicago, Ill.	Chief Research Engineer



Precise
SUPER 40
CUTS
OPERATION
COST
44%
 On
 Carpenter's Level
 at
STANLEY TOOL CO.
 NEW BRITAIN, CONNECTICUT



Our Case History M-101

PROBLEM: To route out casting flash and to de-burr center areas of carpenter's aluminum level.

FORMER METHOD: Hand filing.

PRECISE METHOD: One PRECISE Super 40 Grinder Miller mounted in inverted position under work bench, with T.C. Midget Mill projecting above work surface.

RESULT: A much better, smoother finish and actual cost reduction of 44%!

PRECISE GRINDER MILLERS

Modern Industry's Most Versatile Power Tool

Only PRECISE offers all these features:

Super Speeds up to 45,000 RPM.

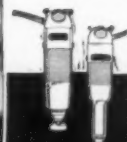
Powerful 1/4 H.P. output at precision ground and honed collet chuck, up to 1/4" size.

Strong, one-piece aluminum alloy housing, precision machined on inside and outside.

Suited for hand grinding and milling as for mounted applications on standard machine tools.

Complete line of machine tool mounts and accessories available.

Send for Free Catalog containing our complete line of Grinder Millers and Power Quills from 1/8 to 1 1/2 H.P. and their amazing adaptability to modern day precision production.



Precise

PRECISE PRODUCTS CORP.

3731 BLUE RIVER ROAD, RACINE, WISCONSIN

Jarvis Adjustable Pitch **LEAD SCREW TAPPER**



NEW!

...a-cost cutting
OPPORTUNITY you
can't afford to miss!

One tapper . . . one lead
screw . . . convertible
in **SECONDS** to
tap *different pitches!*

ANOTHER *Jarvis* **FIRST!**

**send this
coupon
TODAY!**

Jarvis Corporation

Middletown, Connecticut

Yes! I am interested in this new, Jarvis First—
the Adjustable Pitch Lead Screw Tapper.

- ☐ Send details and prices
☐ Have a Jarvis representative call
☐ We would like a demonstration in our plant

NAME.....TITLE.....

COMPANY.....

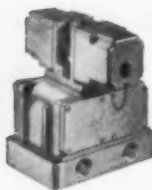
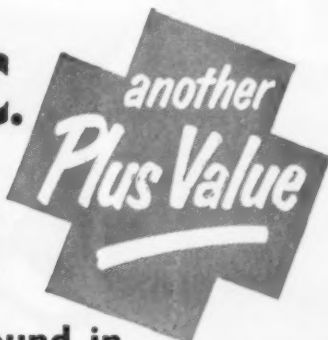
ADDRESS.....

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Changes in Executive and Production Personnel

Name	Company	To	Position
John T. McCarley	Yale & Towne Mfg. Co. Philadelphia, Pa.	West Coast Materials Handling Division San Leandro, Calif.	General Manager
William H. Baier	Armour Research Foundation Illinois Institute of Tech. Chicago, Ill.	Same	Senior Research Engineer
Robert G. Nutting	ARF, Ill. Inst. of Tech. Chicago, Ill.	Same	Senior Design Engineer
Henry M. Pernini	ARF, Ill. Inst. of Tech. Chicago, Ill.	Same	Senior Design Engineer
Erwin P. Pollitt	ARF, Ill. Inst. of Tech. Chicago, Ill.	Same	Senior Design Engineer
Benj. J. Davis	Athol Machine & Foundry Co. Athol, Mass.	Same	Vice Pres.-Gen. Mgr. and Director
Mrs. Effie O. Hill	Athol Machine & Foundry Co. Athol, Mass.	Same	Director

**100% J.I.C.
at no
Extra Cost!**



SERIES 420
NOPAK-MATIC 4-Way
Valve with Double
Solenoid pilot.



**... found in
NOPAK-MATIC valves**

- All models subplate mounted.
- Solenoid inoperative when cover is removed.
- Covers chained to valve.
- Splash- and dust-proof solenoid covers.
- Manual solenoid push-button.
- Positive pressure seals.
- Dryseal pipe threads.

CATALOG 105 describes in detail all of the new and important advantages of Nopak-matic valves. Your catalog will be forwarded promptly, upon request.

NOPAK VALVES and CYLINDERS

GALLAND-HENNING NOPAK DIVISION • 2754 S. 31st St., Milwaukee 46, Wis.

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MACHINE and TOOL BLUE BOOK

A wheel for every job . . .

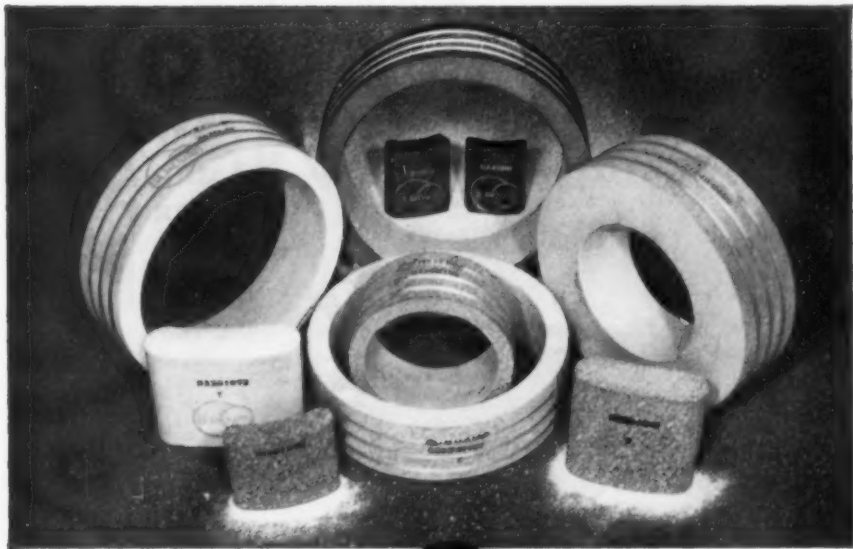
For every surface grinding job . . . whether tough as copper or fragile as glass . . . there's a Blanchard wheel that's best.

Blanchard grinding wheels, for use on Blanchard Surface Grinders, are made in cylinder, segment and sectored types. By selecting from a variety of vitrified, resinoid and silicate bonds and a number of different abrasives, Blanchard is able to make exactly the right wheel for every surface grinding job.

Precision duplication in the manufacture of every Blanchard grinding wheel assures you of identical results on all materials—regardless of finish or stock removal required.

THE BLANCHARD MACHINE COMPANY

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PUT IT ON THE



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Gentlemen: Please send me free copies of "Blanchard Abrasive Wheels and Segments" and "The Art of Blanchard Surface Grinding" (3rd edition)

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FIRM _____ CITY _____ ZONE _____ STATE _____

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Changes in Sales and Service Personnel

Name	Company	To	Position
Edward L. Boersig	GE Metallurgical Prod. Dept. Buffalo area	Detroit	Manager, Component Sales
Gene H. Whitfield	GE Metallurgical Prod. Dept. Detroit, Mich.	Cleveland East Central district	Carboley Carbide Cutting Tool Sales Representative
Eugene W. Mutsaers	Southwestern Eng. Co. Los Angeles, Calif.	Collins Machinery Corp. Los Angeles, Calif.	Vice Pres., Sales
Baron J. Gue	Lincoln Electric Co. Cleveland, O.	Pittsburgh, Pa.	Salesman
David M. Thorsen	Lincoln Electric Co. Cleveland, O.	Union, N.J.	Salesman
William Easterly		Putnam Tool Co. West Coast area	Sales Representative
Ralph J. Davidson	Southern California Gas Co.	Robertshaw-Fulton Controls Co. Long Beach, Calif.	Sales Rep., Heating Controls Div.
Hardie W. Beck	Joseph T. Ryerson & Son, Inc. Pittsburgh, Pa.	Same	Sales Manager

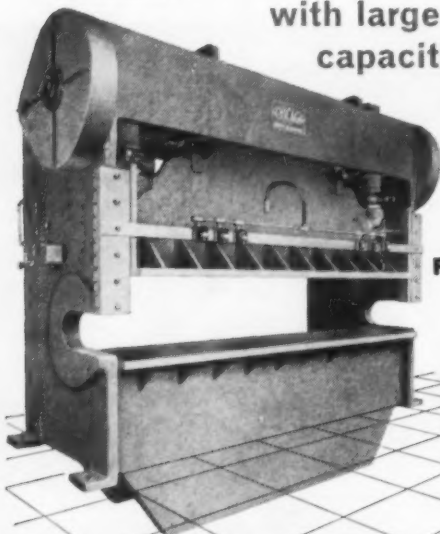


PRESSES

STRAIGHT-SIDE TYPE

with large die area
capacities up to
400 tons

AND
GAP
TYPE
PRESSES



0770.

Complete recommendations for any job on request



Press Brakes • Straight-Side-Type Presses • Press Brake Dies
Hand and Power Bending Brakes • Special Metal-Forming Machines

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MACHINE and TOOL BLUE BOOK



Eugene W. Metcalf



William Easterly



Ralph J. Davidson



Hardie W. Beck

SEE how big 3-D views speed assembly, measurement and inspection of tiny parts

FREE 15-DAY ON-THE-JOB TRIAL!



These essential production tools make small-parts manufacture faster and easier, make precision surer. Views are vivid, magnified in natural 3-dimensional detail. Complete line fits exact model to your specific industrial needs. Dustproof, shockproof, built for rugged production-line use—you can mount them right on machines!

See for yourself! Use a B&L Stereomicroscope on your own job for 15 days—absolutely free, no obligation. All we ask is the opportunity to let our Stereomicroscopes prove themselves to you. Just call your regular B&L dealer, or mail the coupon today.

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BAUSCH & LOMB OPTICAL CO.
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- ☐ Yes, I'd like to borrow a B&L Stereomicroscope for a 15-day trial without cost or obligation.
- ☐ Send me B&L 3-D Micro-Vision Book, containing valuable data, showing actual stereo views.

Name.....

Title.....

Company.....

Address.....

City..... Zone..... State.....

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Changes in Sales and Service Personnel

Name	Company	To	Position
Stephen Smith	Norton Company Worcester, Mass.	Same	Manager, Sales Service Dept.
Joseph J. Hauser	Sablin Engineering Co., Inc. Birmingham, Mich.	Same	Asst. Sales Manager
Frederick M. Jackson	Walworth Co. New York, N. Y.	Same	Vice Pres., Sales

New Dealers and Distributors

Company	Address	Distributor For
Owen-Brink Co.	1036 Lowman Bldg. Seattle, Wash.	DeVan-Johnson Co. Aurora, Ill.
J. L. Axelson Co.	2499 Huntington Dr. San Marino 9, Calif.	Colonial Brush and Machine Co. Detroit, Mich.

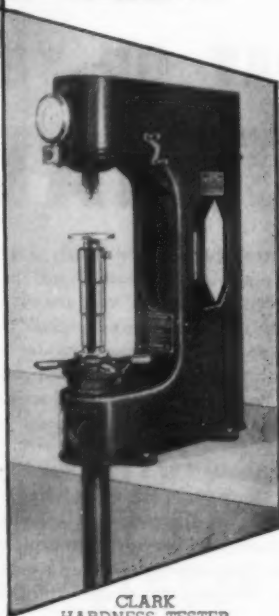


THE MOST FOR YOUR
"ROCKWELL TESTING"
DOLLAR!

The Clark Hardness Tester is precision built to give guaranteed precision results. Thousands of Clarks, with years of service all over the world, attest to this.

The surprisingly low price includes the precision Clark Diamond Cone Penetrator, as well as Steel Ball Penetrators, a wide assortment of Anvils, Test Blocks, and other accessories. Available in two models, for Standard and Superficial "Rockwell" hardness testing, each with choice of 4", 8", 12", or 16" work capacity.

Before you invest in any hardness tester, get the facts about the low price, speedy delivery, and *guaranteed accuracy* of the Clark. Write today.



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HARDNESS TESTER

CLARK INSTRUMENT, INC.

10206 FORD ROAD
DEARBORN, MICH., U.S.A.

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Heller nucut®

LONG ANGLE

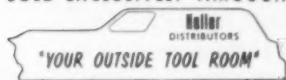
LATHE FILE

*gives smoothest finish
...stays sharp longer!*

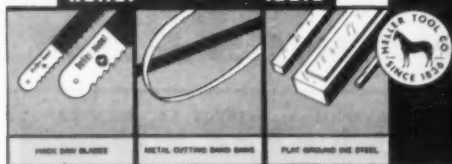
Look at the long 45° angle of those super-sharp precision-cut teeth. It means greater shearing action for removing metal faster and with less pressure without clogging. The long angle provides a self-cleaning action — new chips clear out the old. This special-purpose file is cut from a heavy blank for extra strength and better results on lathe work. Both edges are "safe" to protect work shoulders. It can be used to give the right finishing touch to both hard and soft metals.

You can depend on Heller Nucut Long Angle Lathe Files to speed work and cut costs. A trial is the best convincer.

SOLD EXCLUSIVELY THROUGH



Heller "Job Tempered" Tools



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*A job-proved
Heller product!*

HOLLER for HELLER

...and be SATISFIED!

CHOOSE THE RIGHT FILE FOR

THE JOB! Heller research and over a century of manufacturing experience have been responsible for many of the most practical file developments in the field today. That's why you'll find the *right* files for your jobs among the thousands of types, sizes, shapes, and cuts that make up the Heller **AMERICAN PATTERN**, **SWISS PATTERN**, **VIXEN**, and **ROTARY FILE** lines.

GET LONGER FILE LIFE!

All Heller Files are "Job Tempered" by a unique combination of metallurgical and hardening techniques. That's why Heller files cut faster and last longer . . . are favored by filers everywhere!

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SHARP TOUGH TEETH

FOR HIGH-PRODUCTION METAL SAWING

Barnes Hack Saw Blades have built-in cutting power. The teeth of all Barnes blades are milled to a fine sharpness, accurately set for balance, precisely heat treated for maximum cutting ability.

There is a Barnes high speed hack saw blade with specifications exactly suited to your application.

ROCKET (Flexible)

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MACHINE and TOOL BLUE BOOK

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- cuts machining costs
- prolongs tool life
- speeds output
- gives smooth surface finish



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from your
nearest warehouse

USS FREMAX is a low carbon, high sulphur, free-machining plate steel that is far superior to ordinary carbon plate steels for such machining operations as cutting, drilling, knurling, milling, broaching, shaping, turning and threading. Tests show that FREMAX can be machined at cutting speeds 100 to 200% greater than SAE 1020 plate steel while still maintaining the same tool life, thus enabling you to obtain high production and lower cost per item.

You will find USS FREMAX ideally suitable for dies and molds where a smooth, unblemished surface finish is a prime factor. FREMAX is easy to weld, enabling you to make strong, sound, tight welded joints.



This core for a rubber brake seal mold shows the fine surface finish obtainable on USS FREMAX plate steel.

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WHAT'S NEW IN METALWORKING

MACHINE AND TOOL

blue book

Edited by D. M. Carlson

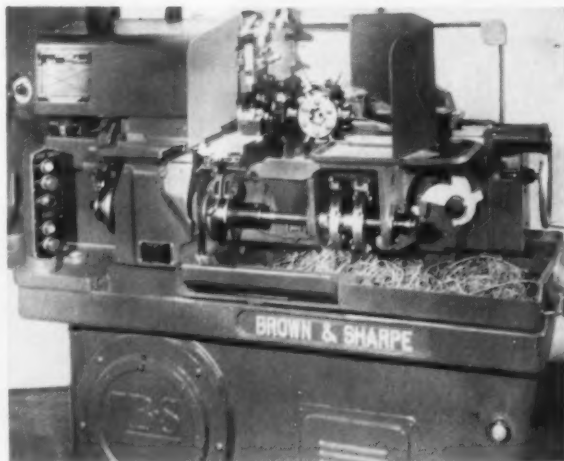
Automatic Screw Machine Introduced by B & S

The No. 2 automatic screw machine is available in three different capacities: $\frac{3}{4}$ ", $1\frac{1}{4}$ ", and $1\frac{1}{2}$ ". The $\frac{3}{4}$ " capacity machine replaces Model No. OG.

Faster production rates can be attained through the higher spindle speeds available, greater range between high and low speeds. For example: The $\frac{3}{4}$ " machine has a maximum speed of 5050 rpm and a minimum speed of 315 rpm in the high speed range. For each of the 18 high speeds there are 12 choices of low speed that can be used. The ratios between high and low speeds range from 2.2-to-1 to 15.-to-1. Top cutting efficiency can be realized from all operations by a simple selection of standard gears to obtain the necessary two-speed combination.

As the capacity of the machine increases, the maximum speeds are reduced. The No. 2 machine with the $1\frac{1}{4}$ " spindle, for example, has a maximum speed of 3500 rpm, and the No. 2 machine with the $1\frac{1}{2}$ " capacity spindle has a maximum speed of 2450 rpm.

Efficient machining of any type of machinable material is promised by the



ACCESSIBILITY OF OPERATING PARTS on the B & S No. 2 automatic screw machine speeds setups. Controls are operated by push buttons.

manufacturer, using high speed steel tools or carbide tools or a combination of both.

All three sizes of the machine have increased turning length. There is a 100% increase in turning capacity between the new $\frac{3}{4}$ " model and the No. OG it replaces. Standard indexing time is now one-half second.

The turret and turret slide are the same on all three machines. This means a minimum of standard tools necessary for any one size.

A standard device identified as a "rapid pull-out arrangement" reduces

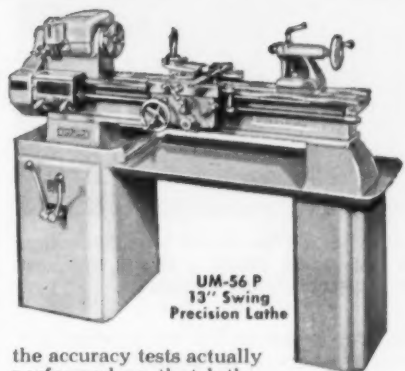
SHELDON Precision LATHES

for the size Lathes You Need Most

Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13" . . . in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.

Powerful, all-V-belt, drive units—either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.

All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of

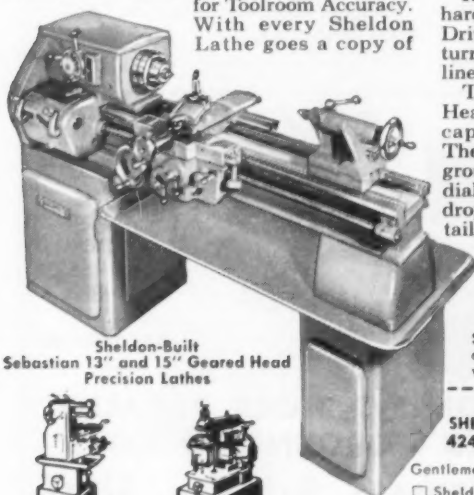


UM-56 P
13" Swing
Precision Lathe

the accuracy tests actually performed on that lathe. (19 checks).

Important optional features include: hardened bed ways, L00 Long Taper Key Drive spindles, 4" D1 Camlock spindles, bed turrets, taper attachments and a complete line of toolroom and production accessories.

The new Sheldon-built Sebastian Geared Head Lathes have greatly increased work capacity and many advanced features. These include a wide, heavy, hardened and ground bed . . . easy shifting spindle speed dial . . . 60-pitch gear box . . . independent drop lever apron clutches . . . cam-action tailstock clamp . . . and, automatic lubrication in the headstock and apron with "1-shot" lubrication of carriage.



Sheldon-Built
Sebastian 13" and 15" Geared Head
Precision Lathes



SHELDON
Horizontal Milling Machine



SHELDON
12" Shaper

SHELDON MACHINE CO., Inc.

Builders of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes.

4242 North Knox Ave • Chicago 41, Ill.

Send in coupon or write for catalogs and names of nearest Sheldon and Sebastian Distributors where you can see these new lathes in operation.

SHELDON MACHINE CO., INC.
4242 North Knox Avenue, Chicago 41, Illinois

Gentlemen: Please send new catalogs describing:

- ☐ Sheldon 10", ☐ 11" ☐ 13" Lathes
☐ Sebastian 13" and 15" Geared Head Lathes
☐ Horizontal Milling Machine ☐ Name of Local Dealer
☐ Sheldon 12" Shaper ☐ Have representative Call

Name _____ Title _____

Company Name _____

Street Address _____ ☐ Company Home

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A POSITIVE STOPPING DEVICE automatically stops the machine and displays a warning light when the last piece in the bar is completed.

the time required for small deep hole drilling where it is necessary to withdraw the drill several times during the drilling operation. This simple attachment allows withdrawal of the drill, clearing the chips and lubricating the point of the drill in the normal index



IT'S A SIMPLE MATTER TO APPLY THE CAM for rapid pull-out when deep hole drilling.

time, regardless of the number of pull-outs required.

Brown & Sharpe Mfg. Co., Dept. DL, Providence, R.I.

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FOR THE
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**A NEW COMBINATION "V" BLOCK PARALLEL
PRECISION MACHINED & GROUND TO .0005"**

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No. 3

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Height.....2¼"
Length.....9"
Width.....3¼"
"V" Opening.....1½"

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Height.....3"
Length.....13½"
Width.....4½"
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**FAWICK-EQUIPPED PRESSES AT
WHIRLPOOL-SEEGER
ASSURE:**

positive protection for costly dies

The quick, accurate starts and stops provided by FAWICK Airflex Clutches and Brakes are vital in the operation of the multiple-die press shown here. This press, at the Whirlpool-Seeger St. Joseph plant, is one of several using complex and expensive multiple dies—some with as many as seven stages built into them. The split-second response of FAWICK units safeguards these costly dies—as well as press equipment and operators.

The performance efficiency of six presses at this Whirlpool-Seeger plant has been improved by the conversion to FAWICK Airflex Clutches. Die setters are especially happy about the selective accuracy of "inching" FAWICK-equipped presses through a cycle in positioning and adjusting dies.

This performance is proof . . . FAWICK is best! The production-boosting, labor-saving, maintenance-eliminating features of Airflex Clutches and Brakes have made FAWICK the leader in making power behave. For information, call or write FAWICK today.

**FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON ROAD • CLEVELAND 11, OHIO**

In Canada: Fawick Canada, Ltd., Toronto

Fawick Type CB Clutch and Type CS Brake units provide vital, accurate operation required on this multiple-die press at Whirlpool-Seeger.

FAWICK *Airflex*
INDUSTRIAL CLUTCHES AND BRAKES

Honing Ball Bearing Raceways

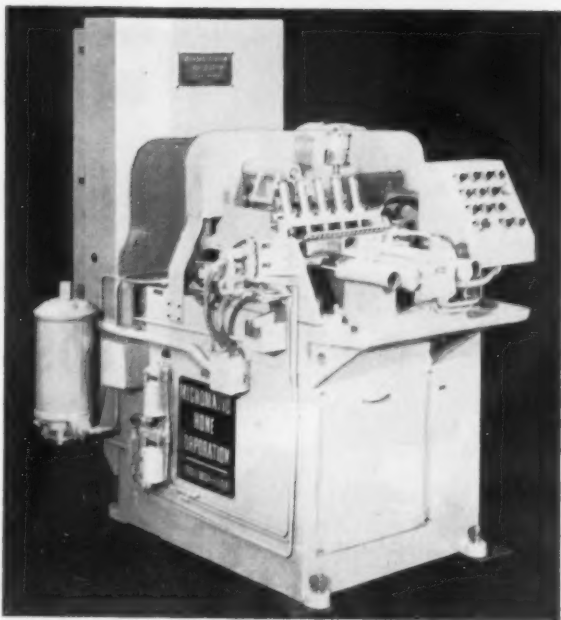
For the first time, both inner and outer raceways for ball bearings are being honed on multiple spindle machines, which have either three or five spindles, depending on the bearing size. The entire operation is automated, including automatic loading and ejection, automatic cycling, and automatic feeding of the abrasives. The machine stops automatically when abrasives require replacing.

As bearing loads and operating speeds have increased, the functional characteristics of the ball raceway surfaces have become increasingly critical. With the steady increase in demand for ball bearings, automatic handling and processing have become necessities in keeping quality up and costs down while meeting the demand for increased bearing production.

The quality of any bearing is no better than the surface on which the ball rolls. Slight imperfection in the raceway means increased friction, noise and reduced bearing life. The noise that a bearing makes when rotated under load is not only an indication of how smoothly the ball is rolling, but is also an important functional factor in itself.

Critical functional characteristics of the raceway include curvature across the raceway, waviness around the raceway, surface roughness and lay of the raceway.

This machine generates the proper functional characteristics on raceways by adapting the basic principles of



honing: (a) a combination of motions that generates true geometric form and keeps the abrasive sticks self-dressing; (b) low velocity abrading with controlled pressure; (c) a float in the tool that allows the abrasive to align itself with the neutral center of the raceway.

Tapered arbors are used for the small inner rings, and end-clamping arbors for larger sizes. The parts are pressed on the arbor and then pulled against a plate that locates them in relation to the tools. The tools are mounted on an oscillating bridge that pivots about the true center of the raceway arc. As the ring rotates, the abrasive sticks sweep across the tracks removing irregularities and leaving a surface that is free of smeared or deformed material.

During the major portion of the timed cycle the bridge oscillates rapidly to give full coverage of the raceway and



The ordinary fasteners securing the worm wheel to the drum shaft in this screw machine loosened, causing \$120 worth of damage. Labor for the repair cost \$100. The fasteners were replaced with self-locking UNBRAKOS, which eliminated the trouble.

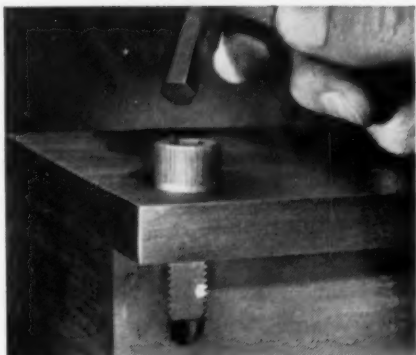
Vibration won't loosen self-locking UNBRAKO socket cap screws

UNBRAKO socket screws with the Nylok* self-locking device eliminate fastener problems caused by vibration.

Take the drive system in the automatic screw machine illustrated above, for example. The screws originally used to secure the worm wheel to the drum shaft loosened, causing considerable damage, besides loss of production time. These have now been replaced with self-locking UNBRAKO socket head cap screws and the trouble has been eliminated.

An UNBRAKO socket screw with the Nylok self-locking device is a single unit. Just screw it into any tapped hole. Seated or not, it locks positively wherever wrenching stops. Constant vibration or endless running of a machine won't affect these self-locking UNBRAKOS. The screws will not work loose!

Write today for your copy of Form 2193, which gives catalog and technical data on the complete line of UNBRAKO socket screws with the Nylok self-locking device. Or see your local industrial distributor. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 52, Pa.



HOW IT LOCKS. The tough, resilient Nylok locking pellet keys itself into the mating threads. It forces threads together and locks the screw securely—whether or not the screw is seated.

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION

U.S. PAT. OFF.,
THE NYLOK CORP.

SPS
Jenkintown Pennsylvania

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remove stock rapidly. The speed of oscillation is then automatically reduced, so that the finished track has all abrasive marks running circumferentially around the track. Outer rings are held in chucks that locate them from the o.d. and clamp on the side faces. The motions and cycling are the same as on the inner rings.

Production on a five-spindle Micro-

honer finishing No. 8 inner bearing is 500 rings per hour. Using three spindles for the outer rings of the same bearing, production is 240 parts per hour. This will vary with the size of the bearing and the condition of the rings as they come to the machines.

Micromatic Hone Corp., Dept. BJ, 8100 Schoolcraft Ave., Detroit 38, Mich.

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to cut man-hours, machine-hours on Non-Ferrous I.D. Machining

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Engineering Dept. W

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Now... **Gorton Milling Machines Feature Hydraulic 3-Dimensional Controls**



"Pencil Pressure" **does the Work**

Gorton now offers you several models of Super-Speed Vertical Mills equipped with sensitive and accurate hydraulic controls featuring feeds up to 40 inches per minute.

AVAILABLE

3

WAYS

1. Vertical action only
2. Cross and longitudinal
3. Three-dimensional combination

Gorton Milling Machines with hydraulic Tracer Control must be ordered as such. Hydraulic equipment is not an attachment but a permanent installation.

For die or mold work (single or multiple units), production profiling and duplicating — short runs, experimental pieces or high production.

Gorton also offers manual and automatic Tracer-Controlled Milling Machines and Pantographs for 2- or 3-dimensional operation; 1 to 1 ratio, or reproduction at variable reductions, with single or multiple-spindle machines for work of any shape or size.

Shown above: Gorton 9-J Super-Speed Vertical Mill with True-Trace hydraulic installation.

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GEORGE GORTON MACHINE CO.

1405 Racine Street

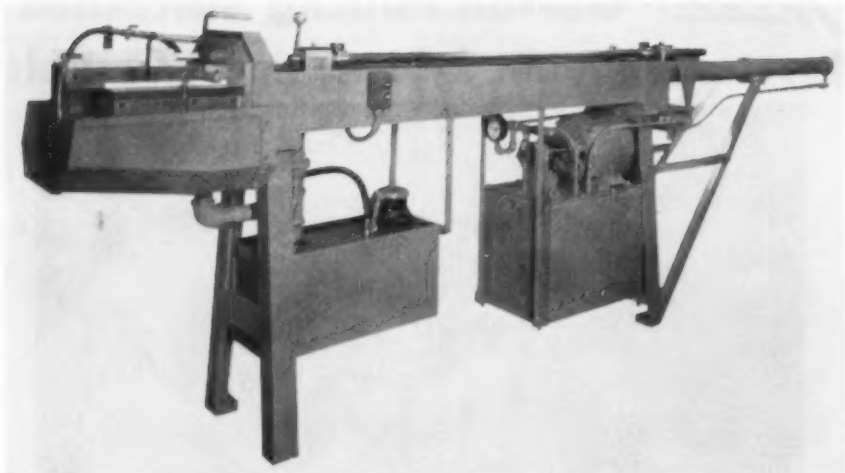
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SINCE 1893

Tracer-Controlled Pantographs, Duplicators — standard and special... Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.



A 8731-IPAR



Broaching Machine

The Conant slide rule broach broaches all tongues and grooves in plastic and magnesium slide rules.

Replacing a milling operation for machining the three slide rule sections, the long stroke—60 inches—is said to

How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.

The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3-16, 1-4, 5-16, 3-8, 7-16, 1-2, 5-8, 3-4, 1"

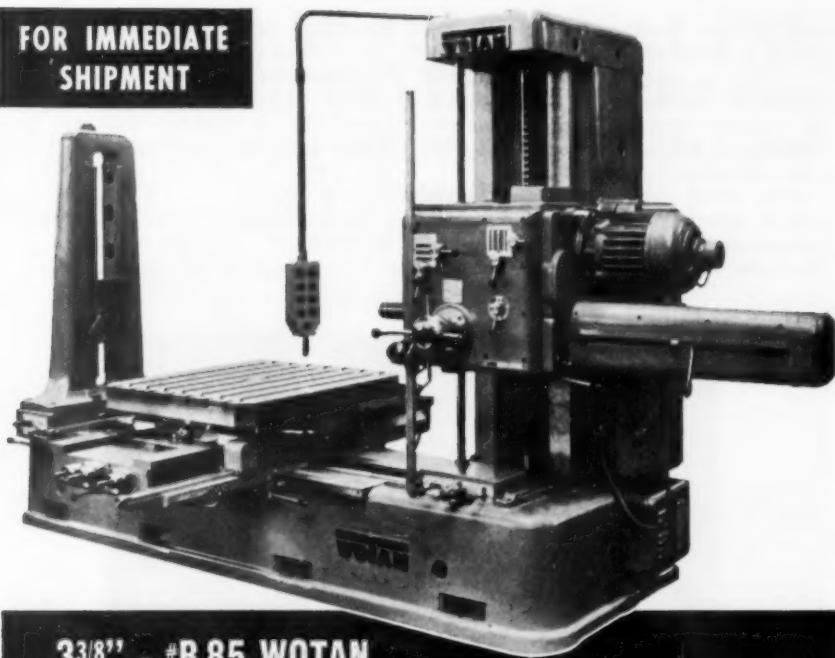
STURDY BROACHING SERVICE, INC.
23516 TELEGRAPH ROAD • DETROIT 19, MICH.



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**33³/₈" - #B 85 WOTAN
PRECISION HORIZONTAL
BORING MILL
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CAPACITY:

Vertical Capacity 36", Distance
Spindle to Outboard Support 86",
M.T. #5, Speeds up to 1000 RPM.

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Parker Machine Company, Inc.

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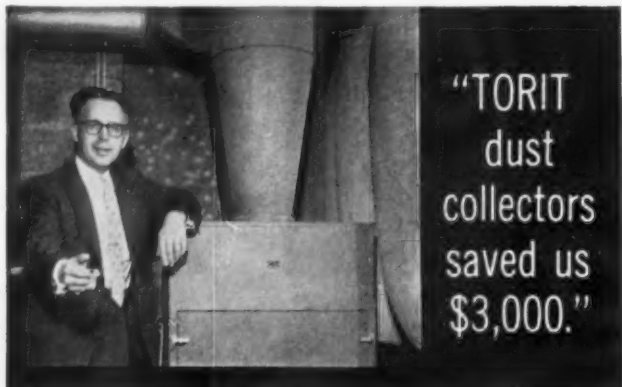
improve the machining operation by giving a better finish to the materials. By sizing the widths and depths of the sliding rule components automatically, the resultant more accurate fitting results in less play in the completed slide rule and smoother operation.

Some other applications involving a close tolerance relationship between a broached hole and some other finished dimension or surface include a vertical

broaching setup for machining crank pin ends of connecting rods; broaching six pads on male and female timing switch in one operation; horizontal broaching of locating flats on main brake shaft two pieces at a time; straddle broaching of two radius slots in steel sleeves.

Conant Broach Corp., Dept. RB, 347 W. 107th St., Chicago 28, Ill.

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"TORIT
dust
collectors
saved us
\$3,000."

FREE BOOKLET shows you how to trap harmful dust better at less cost with TORIT.

Your plant can have the same initial savings and cost-cutting operation now enjoyed by the Sico Manufacturing Company, national producers of tables and seating equipment. Sico President, Kermit H. Wilson states, "... the lowest bid we had for a central dust collection system of minimum capacity was just under \$4,000. Our \$900 Torit installation has completely solved our dust problem and gives us greater flexibility than would be possible with a central system." There's a TORIT Collector to meet every type of dust problem, why not investigate?

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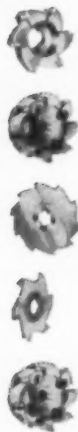
287 Walnut Street, St. Paul 2, Minn., Dept. 602

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HOW MUCH DO YOU REALLY PAY FOR MILLING CUTTERS? Hidden costs make inserted blade cutters more expensive than you think!... **HERE'S PROOF!**



One piece Carbide Tipped cutters have many advantages over inserted blade cutters—better finishes . . . more rigidity . . . closer tolerance milling . . . and one piece safety. Now here is *proof* that solid cutters also save money hour after hour . . . day after day. Don't be fooled by the "do-it-yourself" replacement blade cutters—they're more expensive than you think.



NELCO Cutter Number	TOTAL COST NELCO Solid Tipped Cutter	Replacement Blade Cutter	COST Equivalent Replacement Blade Cutter	COST of set of Replacement Blades*	REMARKS
6104S	31.00	A	75.00	18.00*	Cost of Complete do-it-yourself cutter and two sets replacement blades \$111.00 + replacement and grinding. Cost 3 NELCO Cutters \$93.00.
14112F	140.00	B	336.00	84.00*	Cost of Complete do-it-yourself cutter and two sets of replacement blades \$504.00 + replacement and grinding. Cost 3 NELCO Cutters \$420.00.
12206-1	50.50	C	116.00	40.48*	Cost of Complete do-it-yourself cutter and one set of replacement blades \$156.80 + replacement and grinding. Cost of 2 NELCO Cutters \$101.00.
10306-½	37.00	D	129.00	33.12*	Cost of Complete do-it-yourself cutter and three sets of replacement blades \$228.36 + replacement and grinding. Cost of 4 NELCO Cutters \$148.00.
10108F	86.00	E	292.00	102.58*	Cost of Complete do-it-yourself cutter and four sets of replacement blades \$702.32 + replacement and grinding. Cost of 5 NELCO Cutters \$430.00.

*Figures above do not include removing old blades, inserting new blades and grinding.

FIRST COST IS LAST COST with a NELCO one piece Carbide Tipped Cutter: No expensive downtime to remove, replace and regrind inserted blades. Every NELCO cutter is ready to use—without delay . . . without added "hidden costs!" A spare NELCO cutter costs far less in every way!

Send today for the New Nelco Catalog showing over 700 carbide tipped cutting tools.



NELCO TOOLS

For that **EXTRA** Edge in Production!

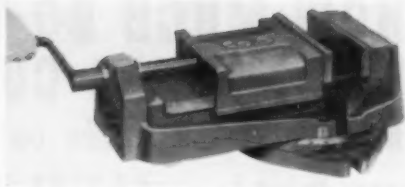
Nelco Tool Co., Inc. • Manchester, Conn.

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Heavy duty machine vise

Low-Boy machine vise Model P-3 has an 8½" jaw width and 6¾" maximum jaw opening with steel jaw plates in place. Removal of the plates allows another 1¼" of jaw opening.

Vise is equipped with coolant run-off trough, bronze nut for the main screw and large main screw for maximum holding power. All working surfaces are ground; the solid bottom slide prevents



chip clogging.

Universal Vise and Tool Co., Parma, Mich.

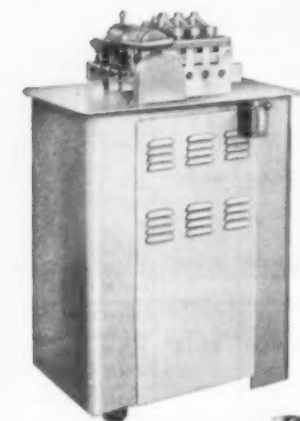
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Economy • Dependability

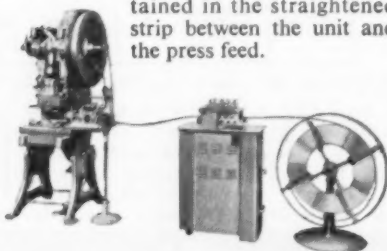
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STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes
—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.



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WITTEK Manufacturing Co.

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Production
Feeding
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5577



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**Assures You
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(JOHANSSON) and accessories. Short deliveries. Inspection and reconditioning service available at our plant.

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(for inside measurements .155 to 24 inches). Scale range plus or minus .001 graduated to .0001 and minus .020 graduated to .0001.

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(Amplifier—for outside measurements) Graduations .0001 to .000001 or .01M to .0002M.

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Multiple Interference Microscope

The Multimi is an instrument for both scientific and practical measurements through which the possibility has been given to everyone to make use of the great advantages of the interference methods. The accuracy of the Multimi is as high as .04 micro inches, which means an accuracy of about the same value as the atomic dimensions. The fringes are here replaced by what can be classified as lines which constitute real profile curves and contours, exactly reproducing surface shapes of different kinds. The instrument is adapted for photographing the interferogram by a miniature camera. Low reflecting, normal reflecting and high reflecting interference plates are available. It is highly recommended for the following: Surface finish measurements . . . surface finish on quartz plates . . . thickness of films and coatings . . . thermal and mechanical deformations . . . cell research, etc.

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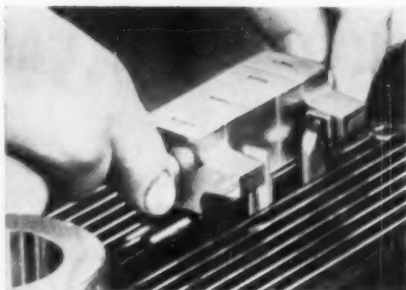
A DIVISION OF SWEDISH GAGE CO.

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**Gage blocks have
"minus nothing" tolerances**

The Ellstrom Standards Div., Dearborn Gage Co., 22035 Beech St., Dearborn, Mich., has announced the adoption of new "minus nothing" tolerances for all its standard gage blocks. The new, closer tolerances—plus 8-millionths of an inch, minus nothing, for working accuracy blocks, and plus 4-millionths,



a Gammons chucking reamer
FOR EVERY JOB . . .

All-Helical



Combination-flute



Duplex Design

Stocked in fractional sizes in straight or Morse Taper shanks $\frac{1}{4}$ " or larger. Smaller sizes in All-Helical with straight shanks.

THE GAMMONS-HOAGLUND CO.
400 MAIN ST. MANCHESTER 3, CONN.

TML BY Harig

6" x 12" precision surface grinder

The new TML by Harig provides extremely fast and accurate grinding, with a new operational ease never before known. 100% more longitudinal travel than before with each rotation of the wheel. You get smooth surfaces in minimum time. Economical—low maintenance.

SPECIFICATIONS

Longitudinal travel.....12 3/4"
Transverse travel.....7"
Vertical travel.....12 3/4"
Working surface of platen12" x 6"
1/2" T slot

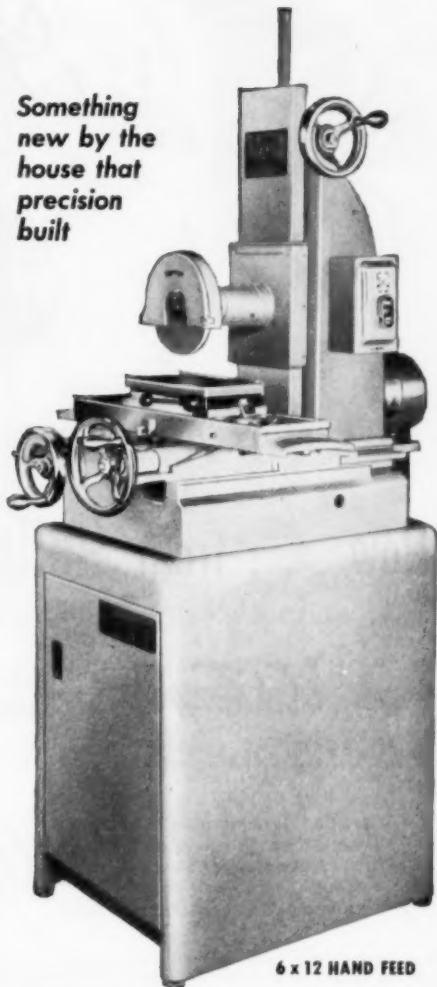
Grinding wheel.....7" dia. x 1/2" face
Grinds 12 3/4" over platen with 7" wheel
Standard spindle speed 3000 R.P.M.
1/2 or 3/4 H.P. motor—Net wt. with motor
575 lbs.

Can be used with or without floor stand.

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house that
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6 x 12 HAND FEED

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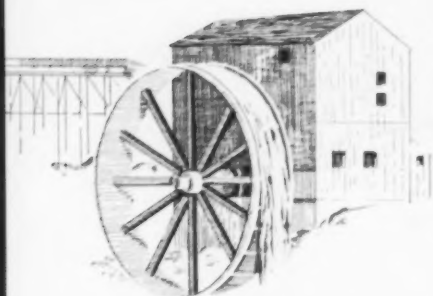
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Company _____

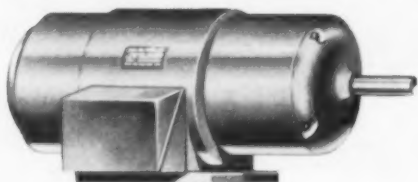
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Great in its day...



RATHER HAVE THE LATEST TECHNICAL ADVANCE?

Now . . . from Heller

Another great technical advance in tools...

***"Job Tempered"* Metal Cutting Band Saws**

Certified by American Standards Testing Bureau to meet their standards for superior cutting — Uniform Teeth . . . uniform set . . . uniform temper*

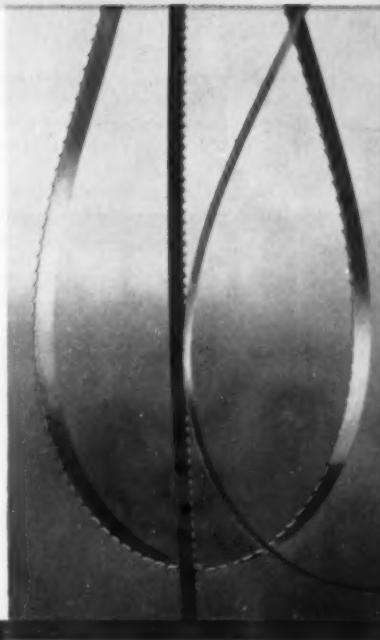


There's a new way to achieve smoother, faster cutting on band saw machines, with longer life on a variety of metals. Heller's "JOB TEMPERED" Metal Cutting Band Saws.

Heller's exclusive metallurgical and heat treating processes that have won these blades the name "JOB TEMPERED" have also earned them American Standards Testing Bureau's Certification. This is your assurance that these blades meet the three prescribed standards for superior cutting . . . uniform teeth . . . uniform set . . . uniform temper. As a result, when you use the *right* Heller Blade for the job, you're sure of superior cutting every time.

Heller "JOB TEMPERED" Hard Edge Band Saw Blades are available in all tooth shapes . . . Standard Tooth (Regular or Wavy Set), Skip Tooth and Hook Tooth. Saws are available in all standard widths and tooth spacings . . . in 100' and 250' coils or welded to specified lengths for use on all type machines.

High Speed Steel Band Saws are also furnished for specific applications.

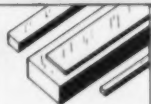




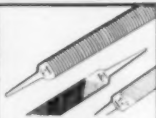
**Heller
nucut**



HACK SAW BLADES



FLAT GROUND DIE STEEL



FAMOUS HELLER FILES

HELLER TOOL CO. Newcomerstown, Ohio
America's oldest file manufacturer A subsidiary of Simonds Saw and Steel Co.

*Give us your toughest
band sawing problems*

If you've been having trouble, let us show you how the right JOB TEMPERED metal cutting band saw can give you better cutting, longer service and greater economy.

Here are the facts!

Heller's new catalog of JOB TEMPERED metal cutting band saws contains full description of types of blades, tooth designs and set. WRITE FOR YOUR COPY TODAY.



SOLD EXCLUSIVELY THROUGH



minus nothing, for inspection accuracy—give users a guaranteed minimum wear factor which substantially increases the useful life of the blocks.

Under present National Bureau of Standards specifications, working accuracy, or "B" grade gage block tolerances should be within plus 10-millionths of an inch, minus 6-millionths, and inspection accuracy, or "A" blocks, should be

between plus 6-millionths, and minus 2-millionths. By eliminating the minus tolerance entirely, gage blocks automatically pick up a guaranteed minimum wear factor equal to the tolerance eliminated. With all deviations taken on the plus side, each block will start wearing towards its nominal size, rather than away from it.

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REDUCE TAP COSTS ^{UP} TO 75%



with
the *Rocket*

TAP SHARPENER

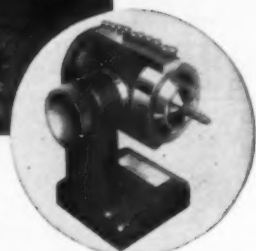
Push button control — no cams needed. 50 series for 2, 3, 4 flutes collet capacity to 1-1/16". 60 series for 4, 5, 6 flutes collet capacity to 2-1/4". Special orders for additional flute capacities.

Use on any tool and cutter grinder or small surface grinder . . . Guarantees precision sharpening through accurate grinding.



Write for demonstration and literature
ROCKFORD DIE & TOOL WORKS, INC.
1820 Seventeenth Ave. Rockford, Ill.

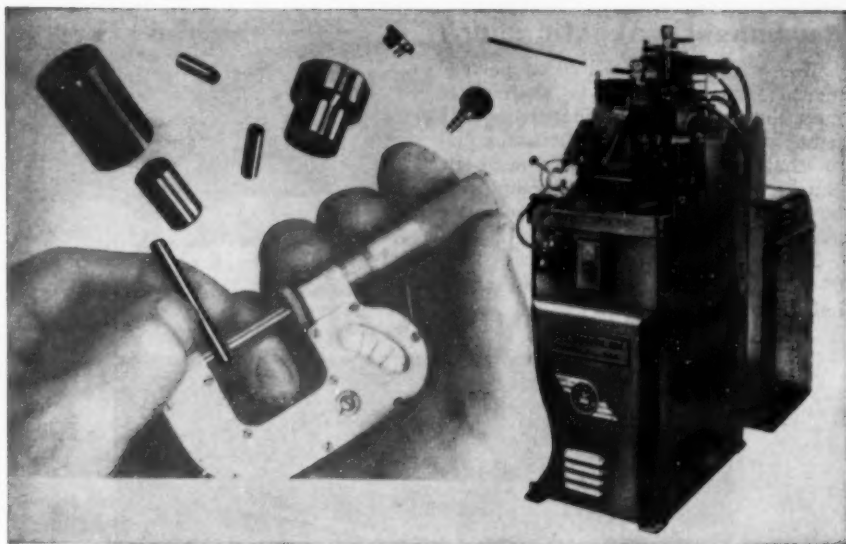
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a low cost

fixture that
sharpens dull taps

- quickly
- economically
- accurately



Production Grind - Tungsten Carbide - Steel - Stainless Glass - Plastic or Carbon to .0002 or 6 to 8 Micro finish *

on the ROYAL MASTER TG-12 Centerless Grinder

Apply the versatile Royal Master TG-12 to your grinding problem.

It will finish grind from .004 to 1½ inches in diameter.

It may be used for either plunge or thrufeed grinding with conversion to either a matter of minutes.

It may be put to work **without** prior spindle warm up time with unparalleled accuracy and dependability - (Based on machines in use for 5 years.)

Low depreciation based on initial cost - Ease and speed of set up time due to accessibility of work zone - Rapid replacement of work wheel and packaged hydraulic system for automatic cycling, are other features of the TG-12. What are your requirements?

* May we demonstrate the TG-12 for you on your parts?

Also Grinds Wood, Non-ferrous Metals, Fibre, Hard Rubber, Cork, etc.

☐ Please contact me regarding my "centerless grinding" requirements.

☐ Please forward literature describing the TG-12.



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CITY STATE

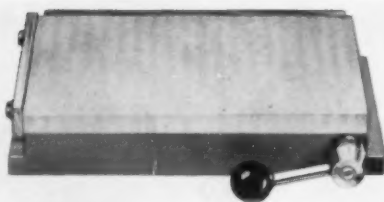
ROYAL MASTER INC. - 220 STATE HWY. 23, RIVERDALE, N. J.

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Permanent magnetic chuck

This multi-pole fine division permanent magnetic chuck is claimed to meet the need of industry for a permanent chuck with fine pole division equal to characteristics of electro-magnetic chucks. This has been accomplished largely by the use of ceramic magnetic material.

Chuck is being made in three sizes: 6" x 10½", 6" x 12½", 6" x 18½", with heights of 2½" and 2¾".

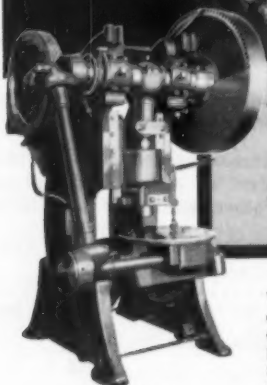


O. S. Walker Co., Inc., Worcester, Mass.

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MODERN
FEDERAL
DIAL
FEEDS

have what
it takes!



No. 7 Dial Feed
Capacity, 80 tons

Write for new Dial Feed Catalog

VERSATILITY
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AUTOMATION

What's the job? A standard operation—or one that's unique to your plant? Modernize with Federal Dial Feeds and watch production go up, costs go down. Eliminate need for expensive equipment. Finest materials and workmanship. 6 to 80 tons. Automatic feeds and ejectors if desired.

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FEDERAL DIAL FEED PRESSES

32 Years' Experience in Dial Feed Engineering and Construction

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Get the complete, revealing Inside Story

on the finest tapping heads ever made!

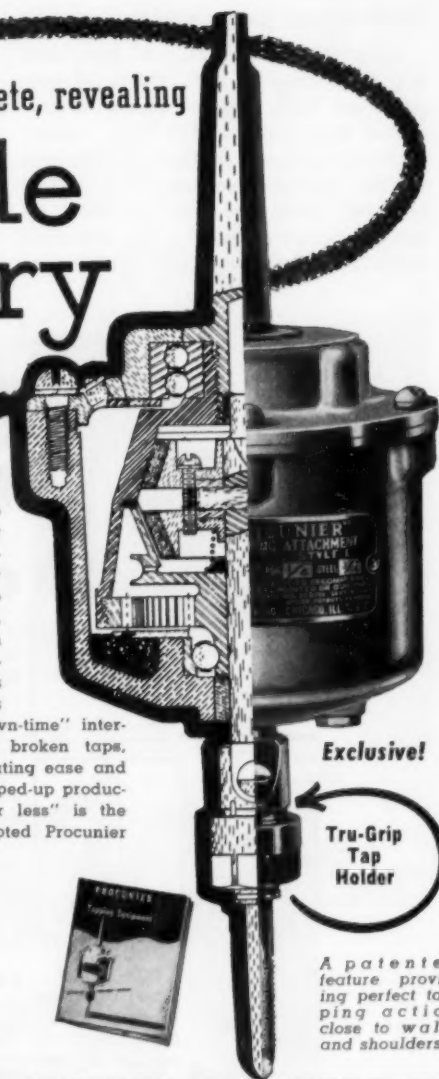
Here's a feature by feature analysis on the amazing Procunier tapping line which clearly explains why they have consistently maintained tapping superiority in the industry for over 30 years! A true "peep-hole" story on the many outstanding construction improvements, the mechanical advancements and precision quality operating advantages that make Procunier heads a "must" in production plants everywhere! You'll learn why Procunier means more tapping hours with a minimum of "down-time" interruptions, accelerated production with fewer broken taps, fewer spoiled pieces and a "new-found" operating ease and convenience that helps operators maintain stepped-up production schedules. "Do more tapping, better, for less" is the slogan in progressive plants who have adopted Procunier heads in their tapping departments.

**Find out how you, too,
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Today

PROCUNIER
SAFETY CHUCK COMPANY

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A patented
feature providing
perfect tapping
action close to walls
and shoulders.

Procunier Safety Chuck Co.

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City

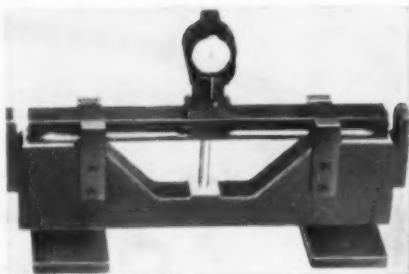
State

Zip

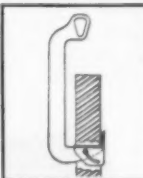
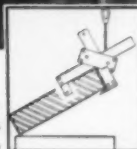
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Universal gage units

All parts of these universal gage units are standard and replaceable. Moving parts are fully enclosed and well protected from dust and foreign matter. The adjusting and changeover from one job to another requires only a few minutes. Units are not obsoleted by model or engineering changes. Standard units are simply removed from the ob-



**MODEL A
COIL GRAB**
Wedge separates
coils easily. Lifts
and turns in one
motion.



**MODEL H
COIL HOOK**
Pivoting shoe
supports, turns,
and locks coil in
position in one
motion.

**One-Motion Reel Loading
Cuts Time and Costs!**

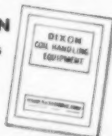
DIXON One-Man COIL GRAB

The Dixon Coil Grab saves labor and speeds coil handling by enabling one man to lift, turn and load coil on the stock reel with a single, easy motion. Forged steel wedge speeds separation of stacked coils. Positive grip and support eliminate coil damage, assure operator safety. Standard models available from stock. Capacities from 1,000 to 5,000 and 10,000 to 15,000 lbs., for coil widths $\frac{1}{4}$ " to 48".

ALL MODELS AVAILABLE FROM STOCK

FREE BULLETIN

Illustrates standard models and shows how to handle all coil sizes safely, rapidly, without damage. Write for it today.



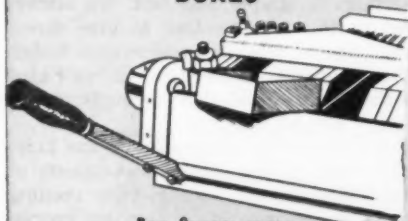
DIXON

AUTOMATIC PARTS HANDLING AND ASSEMBLY EQUIPMENT

DIXON AUTOMATIC TOOL, INC.
2306 - 23rd Avenue
ROCKFORD, ILLINOIS

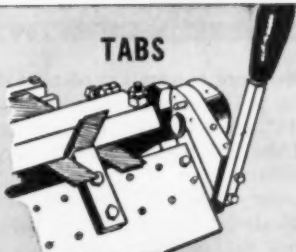
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BOXES



Box fingers space to take box sides.

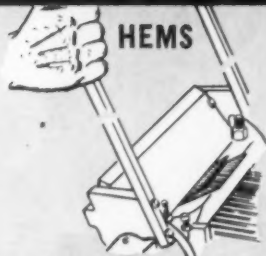
TABS



Bending Block does not disturb flat areas.

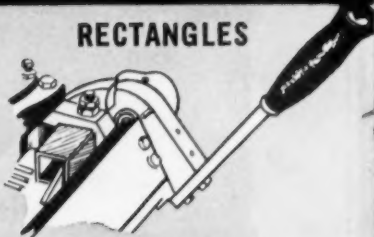
HOW TO FORM... *Sheet Materials*

HEMS



Acute angle is flattened in second bend.

RECTANGLES



Open end finger forms any closed shape.

with a

DI-ACRO BRAKE

The Di-Acro Brake is a six-in-one precision metal working machine simply tooled for a variety of jobs. Ten models in 6", 12", 18" and 24" widths handle up to 16 gauge mild sheet steel.

Consult the yellow pages of your phone book for the name of your nearest Di-Acro distributor or write for 16 page "Handy Guide" to Di-Acro Brakes.



pronounced
die-ack-ro

**O'NEIL-IRWIN
MANUFACTURING CO.**

314 Eighth Avenue • Lake City, Minn.

soleted gage and used in the new gage design.

Shown here is a unit used as a depth gage, on a 14" central base, and stored on a 14" master, used for setting the dial of the indicator. There is no weak neck area to snap if dropped from the bench. Any impact from external or internal shock is absorbed by the gage unit, not the indicator, which is fully protected on all sides by a sturdy guard.

Adjustment of the dial to the master settings is simple and fast. It's always set to the zero reading to give direct readings of the plus and minus factor. The indicator movement is restricted within one revolution throughout the entire checking range.

On all universal gage units the indicator can be rotated in movements of 45°. This feature permits easy reading on large fixture gages, or on special



Mist cooling offers the most effective method ever devised for keeping any tool cool and sharp. It is not only 70% more effective than flood cooling, but it is cleaner, more economical and increases production efficiency and reduces tool replacement costs to an unbelievable degree. Mist removes heat as fast as it is produced. Mystic Mist Generators utilize the principle of refrigeration in cooling tools. Easily and efficiently cools any metal working operation, including band saws, vertical mills, surface grinders, punch presses, etc. Write today for descriptive literature No. 116 . . . it should provide the solution to your cooling problem.



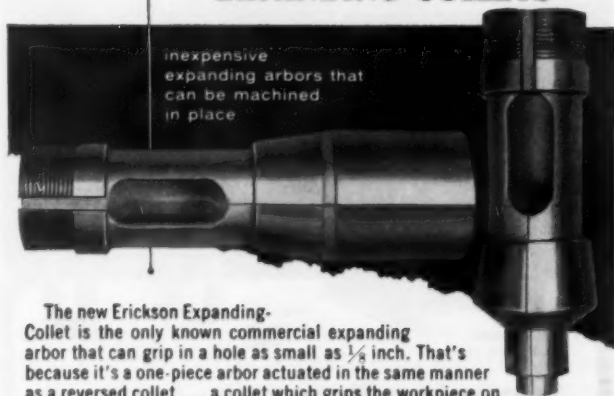
AETNA MFG. Co.

194 SO. YORK ST., BENSENVILLE, ILL.

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NEW **ERICKSON** EXPANDING-COLETS



The new Erickson Expanding-Collet is the only known commercial expanding arbor that can grip in a hole as small as $\frac{1}{4}$ inch. That's because it's a one-piece arbor actuated in the same manner as a reversed collet . . . a collet which grips the workpiece on the inside surface. Because of its one-piece design without drawpin, it gives maximum wall thickness and full gripping power equal to that of a collet.

That means you can convert your machine to internal chucking by merely inserting the new Erickson Expanding-Collet. And since it is machined in place on the machine, it gives greatest possible accuracy . . . can be re-machined for new jobs . . . solves the rush-order problem.

Order a stock of new Erickson Expanding-Colets. They'll save your time, your temper and your money.

AA-4908

ERICKSON TOOL COMPANY

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*Collet Chucks • Floating Holders • Tap Chucks • Indexers • Tap Holders
Air-Operated Chucks • Expanding Mandrels • Special Holding Fixtures*

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machines in cramped areas.

The basic adjustment within this gage is .100. Standard gage extensions are available in length increments of .100 to permit an infinite gaging range, with a limited number of extensions. Standard bases are provided to suit any gaging requirement.

Hanlo Gage Co., Div. of Johnson Die and Eng. Co., 16150 Hubbell Ave., Detroit 35, Mich.

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Tap lubricates at point of cutting

A new tap, the "elektra LUBE," meets one of the critical factors in tapping—proper lubrication. At the actual points of cutting a thin ductile deposit acts as a permanent lubricant.

Under working pressures the deposit imbeds itself into the microscopic pores of the ground tap, resulting in a smooth



Mechanical trimming press

Hydraulic trimming press

Trimming Presses Mechanical and Hydraulic

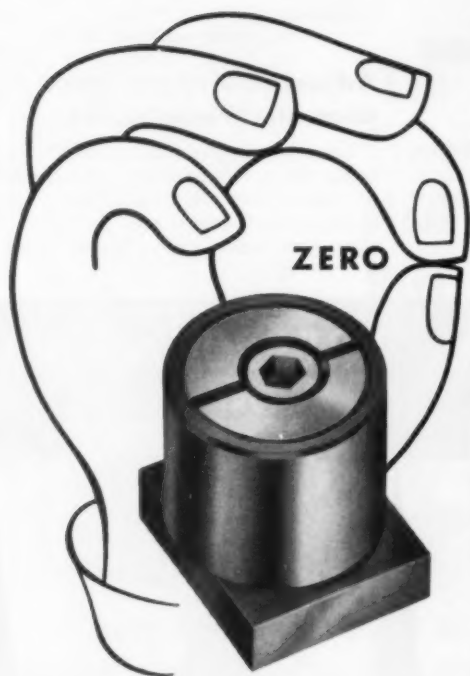
If you have been using stamping presses for trimming operations on die castings, you'll welcome Clearing's new standard line of trimming presses. Featuring large bed and slide areas, these low cost presses give the user a fine machine specially designed for trimming operations. Available in either mechanical gap-type, or hydraulic column type.

Write Clearing for additional information.

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION
Clearing Machine Corporation, 6499 W. 65th Street
Chicago 38, Illinois • Hamilton Division, Hamilton, Ohio
Div. of U.S. Industries, Inc.



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FAST!
Economical
FOOLPROOF

**CONCENTRICITY
IN SECONDS!**

ACE ECCENTRIC FIXTURE KEY

Zero concentricity
in a matter of seconds
for lathe fixtures
mounted on slotted
face plates is only

one of the operations possible with the new Ace Eccentric Fixture Key. Said to be the only fully adjustable reamed hole key available. No longer is there any need of time consuming precision jig boring or slot milling. The alignment of holes and slots is fast, simple and accurate. It quickly and accurately corrects any misalignment of face plates and milling fixtures up to 1/16 inch. Interchangeable keys make your fixtures easily adaptable to any machine having standard width key slots.

WRITE TODAY FOR COMPLETE DETAILS AND PRICES... D

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burnished surface which becomes an integral part of the tap. Since lubrication is obtained at the point of cutting, the tap cuts more freely. The tendency of material to stick to the cutting surfaces of the tap is reduced.

Sossner Tap & Tool Corp., Dept. DL,
Lynbrook, N. Y.

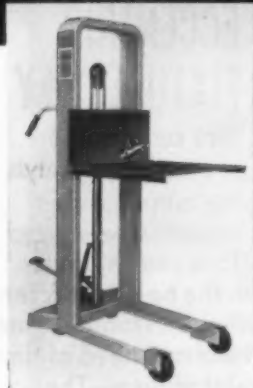
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Adjustable speed drive uses electronic tubes

Electronic adjustable speed DC drive using the driving motor's counter EMF for speed control is claimed to offer closer speed regulation, compact design. Five sizes are available, from $\frac{3}{4}$

PRESTO-Pacer

HYDRAULIC LIFT



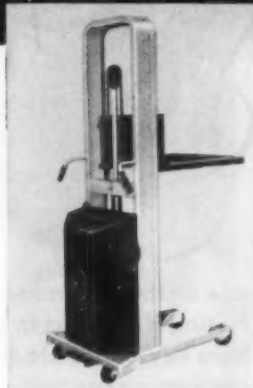
Manually Operated
1000 LB. CAPACITY

\$195 F.O.B.
Factory

Deliveries From Stock

PRESTO-Pacemaker

HYDRAULIC LIFT



Battery Operated
1000 LB. CAPACITY

\$395 F.O.B.
Factory

Delivered Complete
Ready for Immediate Use

• Lifting Height 52" • Platform 24"x24" • Lifting Height 52" • 24"x24" Platform

QUALITY is our most important product



LEE Engineering Company

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Since we standardized on **LAMINA GUIDE PINS and BUSHINGS**"

"We have increased our hits between grinds on high speed precision dies up to ten times more than we previously had since we standardized on Lamina Guide Pins and Bronze-Plated Bushings." And that, as quoted from a user letter, is just one reason why it pays to specify Lamina as your standard, too.

You'll find, in addition, that Lamina Guide Pins and Bushings prolong die life, improve quality control, reduce downtime and cut costs . . . because the special tool steel of Lamina Guide Pins is uniformly heat treated, spray quenched and precision ground to resist wear, bending, "mushrooming" . . . and because Lamina Bronze-Plated Wring-Fit Bushings are strain relieved and pre-finished on the I.D. to assure distortion-free smooth operation, proper lubrication, positive alignment. What's more, there's a Lamina Guide Pin and Bushing for every die set need.

SPECIAL PINS AND BRONZE-PLATED BUSHINGS for any application . . . tailored to your requirements. Send prints for prompt quotation.



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LONG SHOULDER TYPE—Large clamp. Bearing surface contains pin during entire stroke. 2" to 3" pin diameter.



SHORT SHOULDER TYPE—For die space, more bearing space within die area; 7" lengths, pin sizes 1/4" to 2".



NUT TYPE—For wide range of general purpose requirements. Available in 5 sizes, 1" to 2" pin diameters.



REMOVABLE TYPE PIN—Designed for use wherever pin removal is necessary. Offered in diameters from 1" to 3".

Lamina

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hp through 3 hp. Drive provides electronic control of DC motors from AC power.

Each size provides a stepless speed range, 50 to 1, of 35-1750 rpm. There is full motor torque over the complete speed range.

No tachometer is required for any size unit. The drive motor is used as a tachometer also. This reduces the size of the cabinet area, as well as the size of the drive motor. A standard motor

**PROVED STEP
to
MORE OUTPUT
per machine**

NOW YOU CAN HAVE new plant-layout flexibility that lets you put every machine right where it's needed to deliver full output on each job. Barry Mounts make even large machines "portable", level them, and eliminate need for anchoring to the floor. So it is easy to fit plant layout to production needs. And even *daily* plant-layout changes are fully practical.

PROVED SAVINGS

- Savings up to 20% in cost of production labor
- 90% saving in machine-installation cost
- Four-times faster set-up for special production

ARE HIGH COSTS SQUEEZING YOUR PRODUCTION — AND PROFITS? Write today for reprint of "The Iron Age" report on proved savings; also Barry Plant Survey Chart showing cure for eight production losses.

BARRY
CONTROLS
INCORPORATED

BARRY B MOUNT

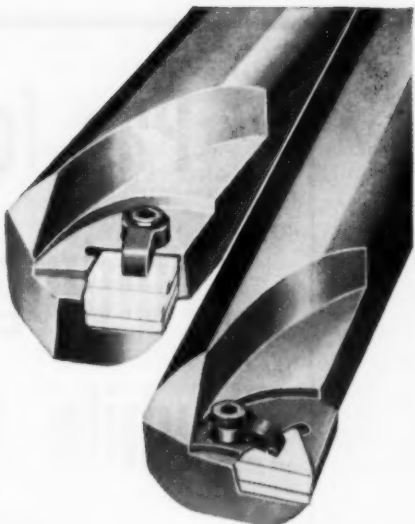
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Now...KENDEX* boring bars

bring all the advantages
of the Kendex principle
to turret lathe boring operations



Exhaustive tests on different turret lathes† prove that Kendex Boring Bars provide all the benefits and economies of the Kendex principle now enjoyed in turning, facing, and milling operations. In addition, Kendex Boring Bars provide the following important advantages in boring operations:

- the cutting point is brought down to the center line of the bar
- greater support of the cutting edge is provided
- better chip control (uses standard Kendex chipbreaker plate)
- boring operations performed better at higher speeds made possible with Kendex bar
- permits use of thin insert—greater resistance to thermal shock
- throw-away insert permits use of harder grades—greater resistance to edge wear at higher speeds

The bar with 15-degree lead angle and square insert together with the bar for turning to a square shoulder with a triangular insert will take care of practically all boring operations—thus eliminating the need for a variety of styles.

- cutting inserts index accurately (saves time on size adjustment)—less downtime
- can be used for both rough and finish boring of pieces up to several inches in diameter

Why not call your Kennametal* tool engineer to demonstrate these new Kendex bars? Or write for additional information, KENNAMETAL INC., Latrobe, Pennsylvania.

*Trademarks

†Tests made on Warner-Swasey, Jones & Lamson, Gisholt and other turret lathes

C-3030



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Pay for Norton grinding machines while they build



*Now you can buy or lease
the most modern grinding
or lapping equipment
on convenient,
economical terms*

By replacing your obsolete grinding and/or lapping equipment with new Norton machines you can meet competition with the best production tools in the field.

You can now gain this competitive strength without risking financial weakness. Two Norton methods offer you logical, economical ways to modernize without jeopardizing your capital position — and without the need of borrowing or of raising money by any other means.

THE NORTON PURCHASE FINANCING PLAN

This Time Payment Plan enables purchase of new machines on extended terms. Simplicity is the keynote. Upon a down payment of 25% of the original purchase price, terms may be extended up to a maximum of five years, at an interest charge of $3\frac{1}{4}\%$ per year. Payments are equal and quarterly, starting 60 days after delivery. In the event that you wish to pay off the entire balance at any time, a discount approximately equal to the unearned interest will be allowed.

THE NORTON LEASE PROGRAM

This Program includes three tested plans for leasing new Norton grinding or lapping machines. Each plan offers you the option of terminating the lease or

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A Wide Choice of Machines

Norton machines available under the Purchase Financing Plan and Lease Program include a broad selection of the most popular types of grinders and lappers. Special arrangements will be considered whenever other Norton machines are required.

For Further Information

see your Norton Representative. He will be glad to discuss the relative merits of each Norton financing method, with regard to your particular requirements. He will also give you complete details of the various machines available and advise you as to which are best suited to your production needs. Or you can write direct. And remember: only Norton offers you such long experience in both grinding machines and grinding wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass.

To Economize, Modernize with NEW



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*Making better products...
to make your products better*

NORTON PRODUCTS: Abrasives • Grinding
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BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Behr-cut Tapes

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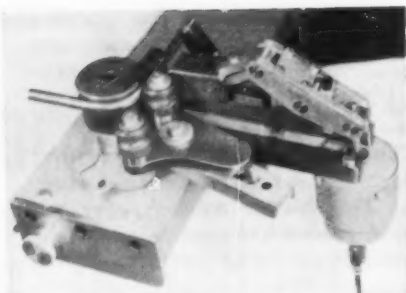
with a single shaft extension can be used.

Weltronic Co., Dept. BJ, 19500 W.
Eight Mile Rd., Detroit 19, Mich.

Use postpaid card. Circle No. 89

Small bending machine

A high speed bending machine, Model 410 Curvit, bends tubing through $\frac{5}{16}$ " dia. and steel rods through $\frac{5}{16}$ " dia. The material is both clamped and formed by power, and one foot con-



Johnson

Speaks for itself in
ANY SHOP!



Model J (Heavy-Duty) (Wet or Dry Models)

Johnson Model "J" . . . the heavy duty band saw that speaks for itself. No other saw handles so many operations so easily and so economically. Why pay more when a Johnson Model "J" can cut the 10" rounds, 18" flats and odd shaped steels of your shop in such labor saving time. The Big "J" is completely automatic—and is available in a wet or dry model, both with variable speed and centralized control system. You can't afford to miss any information on the rugged Johnson Model "J". Contact your dealer today!

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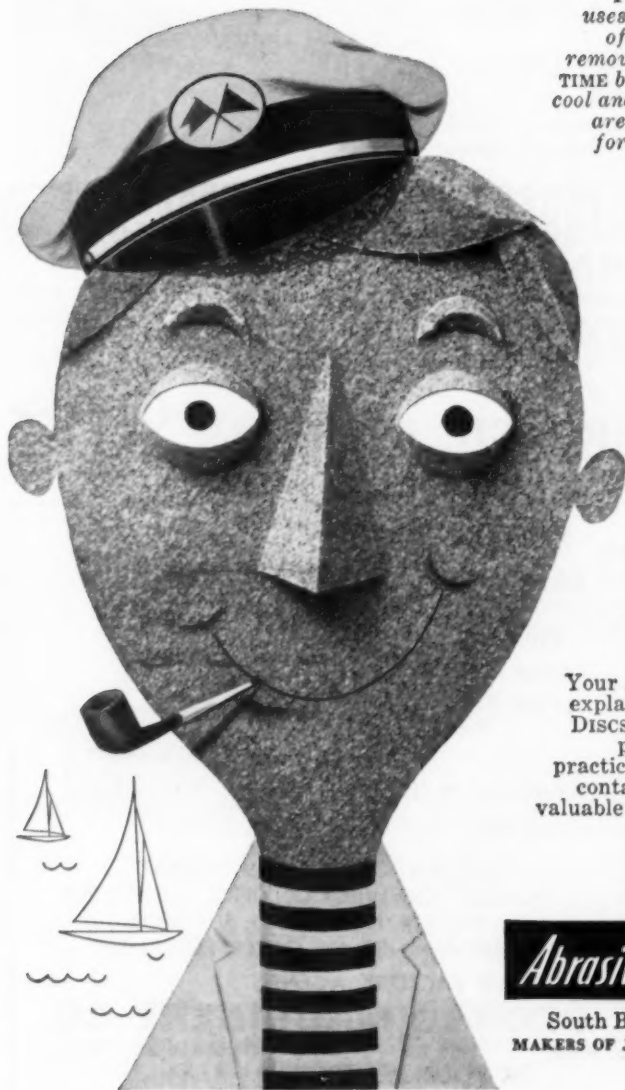
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**No. 5 "Roughing it" with
Reddy MacFlint**



TIME for Spring Sailing.

*The auto body man who
uses JEWELOX FIBRE DISCS
of the open coat type for
removing heavy paint SAVES
TIME because these discs stay
cool and cut clean longer, and
are of sufficient flexibility
for use in curved sections
of the body.*

**"Smoothing
the way
where the going
is rough"**

Your AP representative can
explain why JEWELOX FIBRE
DISCS do not fill up on heavy
paint removal jobs. His
practical knowledge and shop
contacts may help you save
valuable time on some abrasive
operation. Try him.



Abrasive Products, Inc.

South Braintree 85, Mass.
MAKERS OF JEWEL COATED ABRASIVES

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trol operates the entire clamping and bending sequence.

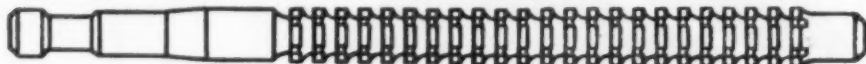
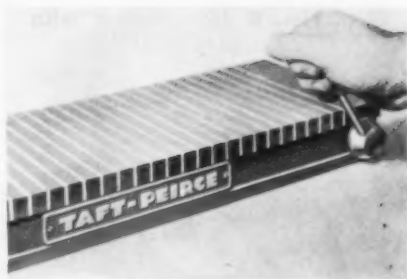
No work is required on the part of the operator other than inserting the material and removing it.

Kilhan Engineering Inc., Box 208,
North Attleboro, Mass.

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Magnetic chuck

Model 824 permanent magnet chuck features all-over holding power. Alnico



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Conant offers complete engineering and manufacturing facilities for your broaching needs. Expertly designed for proper strength and chip carrying capacity. Prompt broach sharpening and reconditioning service. Order standard keyway broaches from our stock. Your inquiry invited. Send us part prints for recommendation and quotation.

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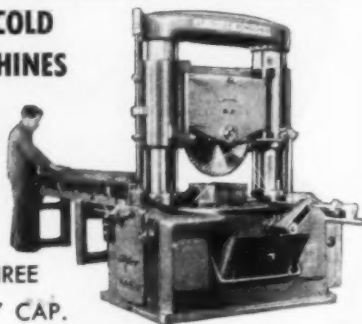
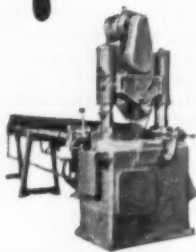
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Ohler

HYDRAULIC COLD SAWING MACHINES

VERTICAL,
RIGID, HIGH
SPEED TYPE.



AVAILABLE IN THREE
SIZES TO 15 3/4" CAP.

AUTOMATIC OR SEMI-AUTOMATIC.
COMPARISON WILL CONVINCE YOU OF THE
OUTSTANDING AND SUPERIOR
PERFORMANCE OF OHLER EQUIPMENT

EXCLUSIVE FACTORY AGENT

JAMES W. GEORGE MACHINERY CO.
519 E. Jefferson Ave. Detroit 26, Mich.

OR YOUR DEALER

V chuck design has eliminated all dead spots and provides full edge-to-edge usable surface. Faceplate uses an epoxy resin, non-magnetic separator material which provides faceplate stability and makes the chuck 27% lighter. Separators eliminate wheel loading while dressing; the chuck can be used for fine tolerance work.

Height, 2-7/16"; work surface, 8" x

24"; magnetic surface, 168 sq. inches, weight, 110 lb.

Workpieces can be moved on and off quickly and easily. It is suitable for handling a wide variety of work, including grinding, light milling and shaping.

Taft-Peirce Mfg. Company, Dept. DL, Woonsocket, R. I.

Use postpaid card, Circle No. 91

FIRST for secondary finishing...



SCHAUER SPEED LATHES

Filing cast iron flange with variable speed type VA3CCA Schauer Speed Lathe.

Schauer Speed Lathes provide the most economical method for performing secondary finishing work on metal and plastic parts. Do filing, trimming, deburring, lapping, polishing, etc., faster, at lower costs on Schauer Speed Lathes. Many sizes and models with holding devices to suit the job. *Speed your production* with Schauer Speed Lathes. Write for Catalog No. 530.

SCHAUER MANUFACTURING CORP.

4502 Alpine Ave. • Cincinnati 36, Ohio

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FORM-TRUE Grinding Wheels

TO "TENTHS" ACCURACY IN MINUTES!

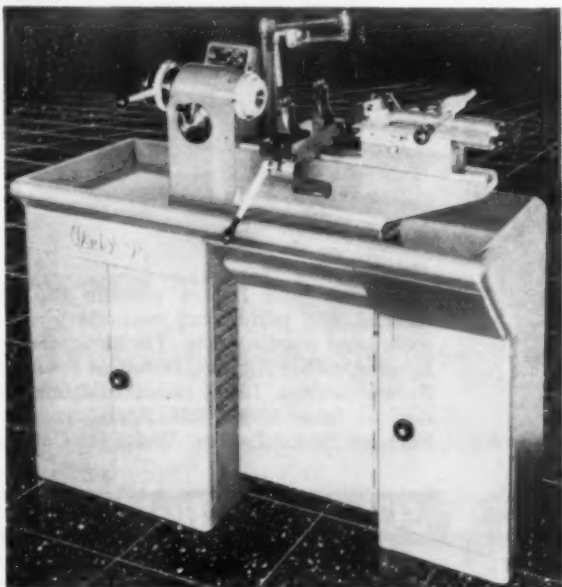
Form complex grinding wheel shapes in minutes. Pre-true same shape as often as required. You'll produce better dies, punches, form tools etc. in hours instead of days. Light, portable, easy to use... and available in the right size and type for your form-grinding machine. Write now for complete information.

 **diaform** **WHEEL FORMING ATTACHMENTS**

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Hand Turret Lathe

Model No. 94 hand turret lathe offers operational ease and speed through the use of infinitely variable speeds (140-3500 rpm) in conjunction with electric clutches for speed changing and reversing functions. The standard constant speed motor powers whole range of speeds without reversals or change of speeds by the motor itself. Thus the motor is protected from the heat build-up and absorption of power from this source. Electric clutches provide immediate high-to-low spindle speed ratio of 5:1, unlimited reversal of the spindle.



The self-centering bed, of flame-hardened and ground Meehanite, is of heavy and rigid construction to insure permanent accuracy and high finish on the work. The double action cross slide employs a variable speed system which gives maximum control for holding size, yet approaches the cut with speed.

The Wade Tool Co., Dept. DL, Waltham, Mass.

Use postpaid card. Circle No. 92

Light duty slip coupling

The new L2 light duty slip coupling for directly connecting two shaft ends features metallic friction plates and is available with bore dimensions of $\frac{1}{2}$, $\frac{5}{8}$, and $\frac{3}{4}$ " diameter in either member. The physical dimensions ($2\frac{3}{4}$ " diameter x $1\frac{1}{8}$ " total shaft length) and the torque ranges are similar to the L2 slip clutch

introduced five years ago.

The coupling is available with disc spring assembly, Type 323 and adjustable torque range up to 9 foot pounds maximum as well as the more sensitive Type 323A which has coil springs to provide the friction plate pressure. The size and number of coil springs can be varied and the coupling can be adjusted to suit any torque range from 0 to 7.3 foot pounds.

Type 323 is intended for general application to provide overload protection between small motors and reducers, conveyors, feeding mechanisms, packaging equipment and similar machines. Type 323A is recommended for installation where the torque must be regulated very closely and for any application involving 2 foot pounds torque or less.

The Hilliard Corp., Dept. RS, 106 W. Fourth St., Elmira, N. Y.

Use postpaid card. Circle No. 93

More Effective Quality Control for High-Precision Production

NEW ELECTROLIMIT SUPERMICROMETER

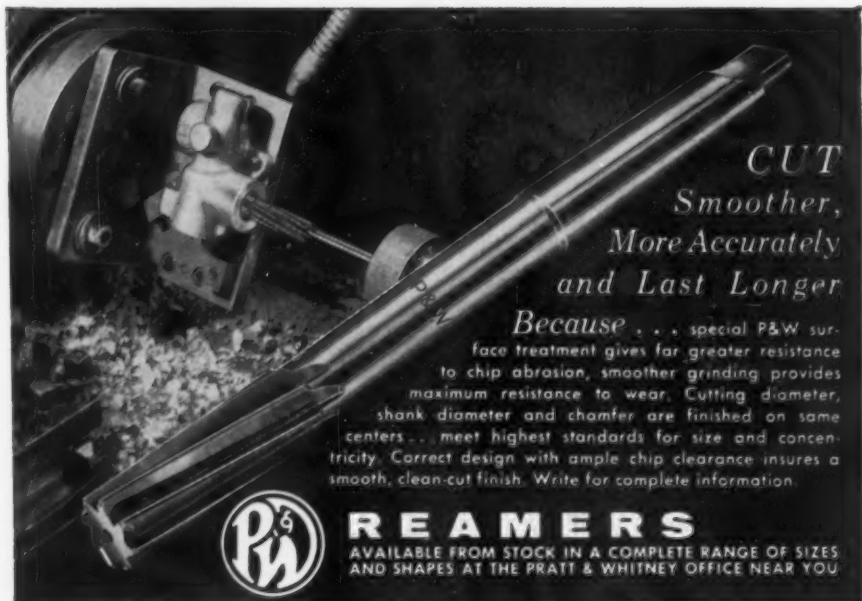
... is easier to read more accurately, with an Electrolimit Tailstock and high magnification instrument cabinet. Using it as a comparator, the operator reads at a glance in .00002" increments exactly how much a part is over or under the required dimension. Ideal for checking at the machine on lapping, final grinding and inspection, its use effectively eliminates errors and reduces scrap losses.

CONVERT YOUR SUPERMICROMETER. Electrolimit Tailstock and instrument cabinet can be furnished as a separate package. Write for details. Pratt & Whitney Co., Inc., 22 Charter Oak Boulevard, West Hartford, Conn.




PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES • CUTTING TOOLS



CUT
Smoother,
More Accurately
and Last Longer

Because . . . special P&W surface treatment gives far greater resistance to chip abrasion, smoother grinding provides maximum resistance to wear. Cutting diameter, shank diameter and chamfer are finished on same centers . . . meet highest standards for size and concentricity. Correct design with ample chip clearance insures a smooth, clean-cut finish. Write for complete information.

 **REAMERS**
AVAILABLE FROM STOCK IN A COMPLETE RANGE OF SIZES AND SHAPES AT THE PRATT & WHITNEY OFFICE NEAR YOU

Use postpaid card. Circle No. 373

Optical Profile Grinding Machine

A product of West Germany, the Petewew PFS 4u optical profile grinding machine is available with magnification of 10x, 20x, 50x, 100x and handles a maximum workpiece thickness of 3.15".

By using the episcopic and diascopic light for the projection, it is possible to grind all types of forms by flat form grinding, relief form grinding, axial circular form grinding and radial circular form grinding with an accuracy of plus/minus .00008" at 100x magnification.

Carl Hirschmann Co., Inc., 30 Park Ave., Manhasset, Long Island, N.Y.



Use postpaid card. Circle No. 94

Lubrication unit 33AG-4 supplies air actuated feed mechanisms, chucks, clutches, brakes and other air-operated parts of machine tools with filtered air, regulated air pressure and Micro-Fog lubrication—oil particles of micron size. Visible oil feed for accurate flow control. Lubricator performance over an air flow range of 4 cfm to 85 cfm. C. A. Norgren Co., Dept. OH, Englewood, Colo.

Use postpaid card. Circle No. 95



Clinch Nuts. The range of clinch nuts employing the Nylok self-locking principle has been enlarged to include sizes down to No. 0. They are available in a wide range of ferrous and nonferrous materials. Self-locking principle eliminates the need for lock washers, lock wires and other forms of safety fastening.

Nylok Corp., 609 Industrial Ave., Paramus, N.J.

Use postpaid card. Circle No. 96

Strate-Face Tap, for cast iron use, has a straight cutting face with a scientifically determined rake angle for freer cutting. It also provides greater accuracy in tapped hole sizes. New flute and core design is claimed to result in a stronger tap, longer tap life and less breakage. Taps are available in standard ground thread sizes from No. 6 through 3/4". Besly-Welles Corp., Dept. RB, Beloit, Wis.

Use postpaid card. Circle No. 97



MILLING CUTTERS

*A Complete Line of the
Highest Quality*

Whatever your needs, you can get the right standard or special milling cutters to do the job better from one convenient source . . . Pratt & Whitney. Like all other P&W Cutting Tools, you can be sure they'll cost you less in the long run . . . because they run longer! Write now for complete information. Pratt & Whitney Company, Inc., 22 Charter Oak Boulevard, West Hartford, Conn.

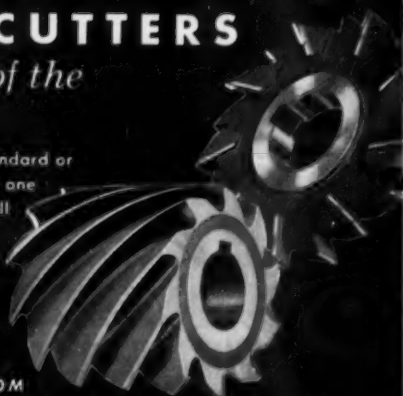
AVAILABLE FROM
STOCK AT THE P&W BRANCH OFFICE NEAR YOU



PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS



**LIVE CENTER
ACTION WITH
DEAD CENTER
ACCURACY**

USE



**ANTI-SCORING
LUBRICANTS**

**PROVE IT TO
YOURSELF IN
YOUR OWN PLANT FOR ONE
DOLLAR AND THIS COUPON!**

Free-running on dead centers—with COMPLETE protection. CMD Lubricants are CONCENTRATED, form a "tough" film—absolutely NO GALLING or SEIZING—under the heaviest load. STABILIZED for added "oiliness" giving longer, smoother runs without slip-stick action. It all adds up to LIVE CENTER ACTION with DEAD CENTER PRECISION. The bigger the job, the better you'll like it.

**TRIAL ORDER—
TWO FOUR OZ. TUBES \$1.00**

Send me my order of CMD right away!

Bill me ☐ Bill my company ☐

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Company Name

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1906 West 46th St., Chicago 9, Illinois

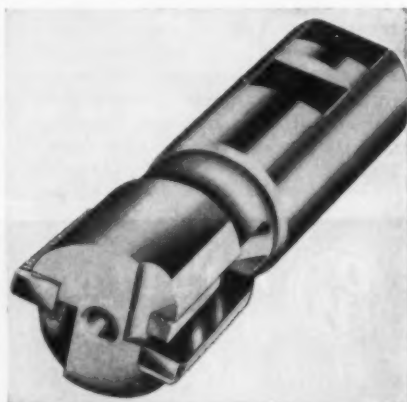
**CHICAGO MANUFACTURING
AND DISTRIBUTING CO.**



Straight shank end mills for light metal alloys

A self-gaging design that minimizes grinding time plus quick-change diameter adjustments are features of a new series of inserted carbide tipped blade straight shank end mills. Standardized specifically for high-performance milling of aluminum and light metal alloys, nine different sizes are available.

Diameters range from 1-inch to 2½-inches; length of cut is 1½-inch or 2-inches; shank lengths from 2¼-inches



to 3¼-inches, and shank diameters from 1-inch to 2-inches that fit standard end mill holders. Right-hand cut is standard.

Blades are held securely in the cutter bodies by replaceable serrated wedges that combine to produce crosslock construction. For quick adjustment, cutter diameters can be increased in 1/32-inch increments by setting blades on serration. No gages are required to check uniformity of blade projection as this is controlled by the serrations.

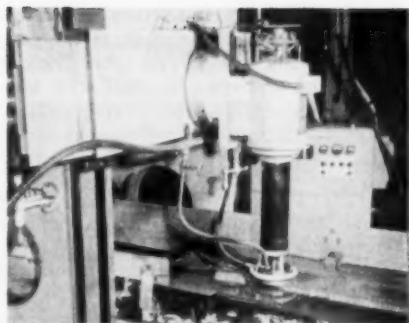
Goddard & Goddard Co., Dept. BJ,
12280 Burt Rd., Detroit 23, Mich.

Use postpaid card. Circle No. 98

Use postpaid card. Circle No. 375

Spindles for electrolytic metal removal

The Standard Electrical Tool Co., 2486 River Rd., Cincinnati 4, Ohio, has announced that all of its "Super Precision" spindles, whether motorized or independent drive, are available with the accessories separately described to serve electrolytic metal removal. This involves the assembly of a slip ring on the back of the spindle for carrying the direct current through the spindle to the wheel, the wheel acting as the negative pull while the work piece represents the positive pull.

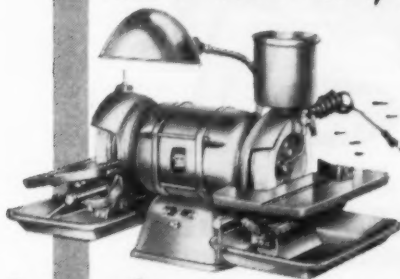


Assembled on the wheel end of the spindle is a sprinkler-spider of circular

LAST YEARS LONGER!

Baldor GRINDERS with TOTALLY ENCLOSED MOTORS

600 Series Grinder. 1/2 HP, 1 phase, 60 cycle, 3450 RPM, 6" wheels, \$59.50
Pedestals available for all models



Carbide Tool Grinder. Sharpens quickly, accurately. Reversible 1/2 HP motor withstands repeated overloads. 1 1/2" wide wheels. \$171.70



Specially engineered for extra heavy-duty, precision grinding! You can't get more regardless of price!

- Totally enclosed, splash-proof motors keep out dust, dirt, grit, metal particles. Can't clog... can't cause trouble!
- Lifetime lubricated ball-bearing motors never require servicing! Dynamic balancing assures smooth operation without vibration.
- Complete line—1/4 HP to 3 HP, 6" to 12" individually balanced wheels. Bench and pedestal types.
- Fully guaranteed by Baldor—famous for fine grinders for more than 35 years!

It pays to use dependable Baldor Grinders!

BALDOR ELECTRIC CO.

4364 Duncan Ave. • St. Louis 10, Mo.

Write for Bulletin 321-M

Use postpaid card. Circle No. 376

design with hose connection for spraying the electrolytic solution at the perimeter of the wheel. The wheel holder has an integral circular well with tangent holes arranged to carry the electrolytic solution in the wheel recess, both delivering a flooding of the work area.

The direct current passing through the spindle is completely isolated, eliminating pitting of ball bearings. Isolation

barrier allows the direct current to be transmitted through a motorized alternating current spindle with maximum efficiency.

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Air operated lever closer

This lever closer for Wade machines is simple to operate. With actual piston speed easily controlled for either direction, an air cylinder plunger, operated by electric valves and tied to a



SAVE PRODUCTION COSTS WITH . . .



quadrill

4 POSITION DRILLING & TAPPING TURRET HEAD

Holds four drills or cutting tools. One tool only operates when head is in operating position. Drills to full capacity of drill press. Send for complete information today. Be sure to specify size and make of drill press when ordering QUADRILL.

CHICAGO QUADRILL

Company

1846 BUSSE HIGHWAY • DES PLAINES, ILL.

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MACHINE and TOOL BLUE BOOK

Why the Die Maker Prefers **PRODUCTO** Die Sets



Volkert Stampings, Inc.

The die maker likes to work with Producto Die Sets

He knows Producto die sets are easy to assemble—especially those equipped with the unique new Qwik-Fit Guide Pins*.

He has confidence in the consistent accuracy of Producto sets. He has found that they always align his dies correctly.

He knows he can choose from a variety of thicknesses the Producto die set that meets the strength requirements of his die.

He favors Producto die sets because they are dependable. They will perform on the press as well as they did in tryout.

He likes the attractive, streamlined appearance of Producto sets. They make his dies look better and increase his pride in these products of his craftsmanship.

*Patent Pending



PRODUCTO

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

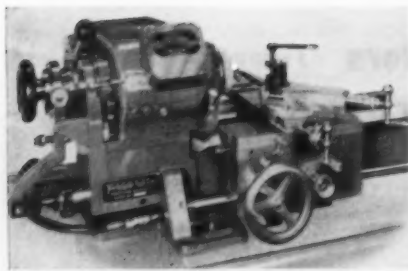
He knows that a nearby Producto warehouse can supply any catalog die set he needs...and that orders for specials are promptly processed. He can count on having the die set by the time he needs it.

The die maker has found that all of his requirements are met by Producto die sets. You will, too, when you place your order with Producto.

DIE SET DIGEST, our eight-page quarterly, contains valuable data for designers, makers and users of dies. Write to have your name added to mailing list.



THE PRODUCTO MACHINE COMPANY
960 Housatonic Ave., Bridgeport 1, Connecticut



simple mechanical linkage, provides the force to actuate the lever closer. The electric valves are remotely controlled by either push buttons or foot switches. The lever closer fingers are actuated by a ball bearing and there is no load on this bearing in either the on or off position.

Operating pressure is controlled by a pressure gage. A filtered air supply



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to machinery
with
automatic
protection...*

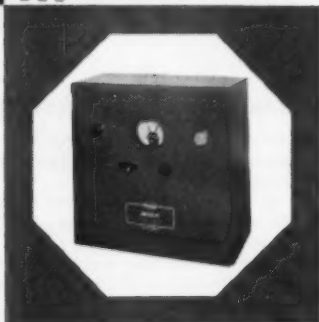


monitron

Stop damage from pile-ups, misfeeds, dull tools, oversize stock, faulty lubrication, etc.

Monitron senses load increase or decrease, stops motor, releases clutch, applies brake — before damage is done.

Monitron protects electrically driven presses, dieing machines, conveyors, pumps, automatic machine tools. Send coupon for full information.



SPERRY PRODUCTS, INC.

Danbury, Conn.

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Please send me complete data on the Sperry Monitron.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

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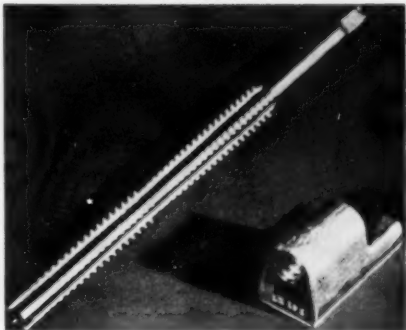
passes through a lubrication device. Proper collet tension is obtained through the use of an infinitely adjustable clamp.

Wade Tool Co., Dept. DL, 49 River St., Waltham 54, Mass.

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Tap does work of several tools

The Uni-Pass tap accomplishes with a single tool work that previously required a set of two to four taps. In addition it eliminates other problems associated with the Acme thread form. This tandem style tap produces threads of 10° to 30° included angle in a single pass. Roughing section of the tool has a thread with a greater included angle (to 50°). The advantage of this design is that threads can be relieved more effectively and the wide flat crest is absent. This results in free-cutting characteristics which make it possible to design it for increased stock removal.



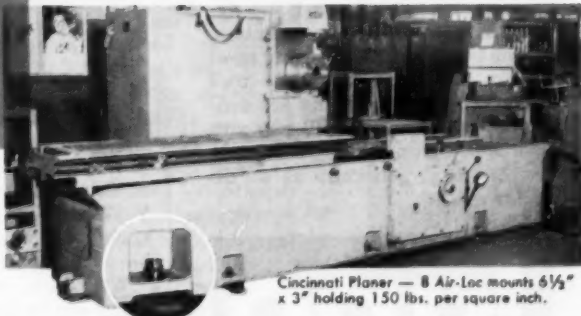
The last few threads on the roughing section function as a guide to the leads in the finishing section. This finishing section corrects the angles and brings the thread up to size.

Because the starting threads serve as a pilot, leadscrew equipment and skilled operators are not required. Reaming is eliminated and thread tolerances are maintained on the starting

PERMANENT PRECISION INSTALLATION OF MACHINES is POSSIBLE with



the VINYL mount that reduces vibration and noise, requires no bolts or cement —



Cincinnati Planer — 8 Air-Loc mounts 6 1/2" x 3" holding 150 lbs. per square inch.

• Installations maintain accuracy to .0005" •

Thousands of lathes, grinders etc. are now installed on patented *Air-Loc* mounts which can be re-used when machines are moved. Easy shimming for quick precision leveling. Write for free samples and literature.

AIR-LOC DIVISION
Clark, Cutler, McDermott Co.
3 W. Central Street
Franklin, Mass.

Use postpaid card. Circle No. 380

**HIGHER SPEEDS!
FASTER GRINDING!**

kipp

AIR GRINDERS

MODEL JA
50,000 R.P.M.

\$42⁰⁰
IN U.S.A.



Weight 12 ounces;
length 6½ inches;
chuck size ¼ inch.
Wheel guard removed
for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle. That means better work—longer wheel life.

High speed grinding with small wheels was a Madison-Kipp development of the late twenties. It was born out of a pressing need in our tool room. Because tool room grinding problems are universal, we believe it will pay you to utilize Kipp grinders in your tool room as generally as we do in our own.

kipp

MADISON-KIPP CORP.

207 Waubesa St., Madison 10, Wis., U.S.A.

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256

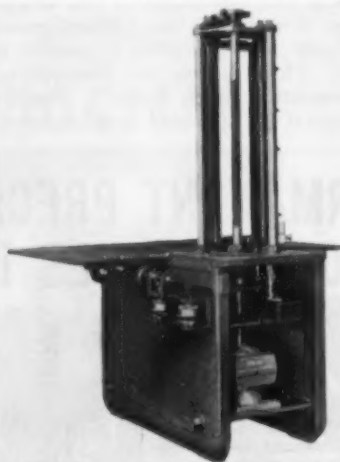
threads of the nut where difficulty was previously encountered. Breakage caused by excessive torque and chip loading is eliminated because of the free-cutting characteristics of the roughing section. The tool will produce threads in a single pass in nuts three to five times as long as the thread diameter.

Regal Div., Beloit Tool Corp., Beloit, Wis.

Use postpaid card. Circle No. 102

Register print work now possible with grainer

A timing, or registering, device that makes possible mass production printing of any desired graining design at identical positions on each and every side of wood, plastic or metal cabinets



or doors is now optional equipment on V-27 vertical grainers. It can also be added to grainers now in use, but must be installed at the factory.

With this equipment, cabinets and doors can be grained in mass production with the assurance that the choice swirls and designs will match in assembly.

Hamant Tool Co., Inc., Dept. BJ,
3913 E. Second St., Dayton 2, O.

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MACHINE and TOOL BLUE BOOK



Half the Cost of "a Pack a Day"

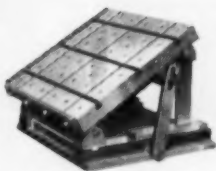
CUTS TOOLROOM COSTS

THE *Robbins* WAY

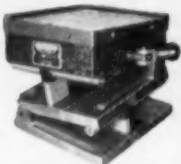
Robbins angular tooling equipment often pays for itself the first few times you use it . . . but let's be conservative. Let's talk about writing off the cost over ten years. (About half the useful life of a "Magna-Sine!") Written off in this manner, the Model A-5 Magna-Sine illustrated represents an investment of around twelve cents a day!

This equipment saves dollars of valuable toolroom time on every job. Set-ups that require *hours* by other methods take just *minutes* the Robbins way. Set up to machine, grind or inspect any angle in just four simple steps: (1) Look up required angle in Table of Constants furnished with unit, (2) Select gage blocks indicated, (3) Place blocks between base and sine bar swivel block, (4) Secure the work . . . and you're ready to go!

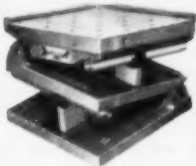
This simple, fast, sure method sets up any angle, single or compound, right or left hand, without V-blocks, angle plates or complicated "build-ups." Complete range of models and sizes puts Robbins precision equipment within the reach of every shop. Write now for literature.



HEAVY DUTY SINE PLATE
FOR MACHINING



"MAGNA-SINE" WITH
MAGNETIC TABLE



FOR INSPECTION AND
LIGHT MACHINING

OMER E.

24800 PLYMOUTH ROAD

Robbins

DEPT. A

COMPANY

DETROIT 39, MICH.

Also manufacturers of special machinery, automatic assembly machinery.

5937

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ROTARY AND INDEXING TABLES AND ANGLE VISES

to speed up production
on Milling Machines
or Drill Presses

USED IN ALL INDUSTRIES

Everywhere

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Rotary Table. Cross
feed slides and rotary
Feed. Converts for vertical
milling. 8" diameter
\$79.95



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Tilting Rotary Table.
Rotary and cross feeds
in one unit, 90° angle
adjustment. 8" table
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No. 86

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Table. Graduated rotary
feed. 8" Table
diameter \$69.95



No. 96 (not shown),
6" Table diameter, only \$59.95

No. 60B



Machine Vise.

6" jaw width, a

precision vise with

swivel base \$99.95

Without base, No. 60 \$89.95

Also 40B. 4" jaw, with swivel base \$79.95

Without base, No. 40 \$69.95

123

There are 64 different models and types of
Palmgren vises, rotary tables, milling attach-
ments and other machine tool accessories,
comprising the most complete line available,
with jaw sizes from 1½" to 8".

Ask for new catalog No. 205 for complete line,
details and prices.

CHICAGO TOOL & ENGINEERING CO.

8314 South Chicago Ave.

Chicago 17, Illinois

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258

Wet blast unit

This versatile wet blast unit is adapt-
able to the deburring of small machined
components.

Operated from a sitting position, the
operator picks up the parts, loads them
(two at a time) into the two gasketed



bays at the top of the cabinet and de-
presses the foot switch to blast. Guns
within the cabinet may be fixed in
position, rotated or stroked if necessary.
The unit in the photograph shows an
air cylinder used for a lateral stroking
motion. Masks may be fitted in the
work loading bays for the protection of
areas not requiring blasting.

Cro-Plate Co., Inc., Dept. DR, 747
Windsor St., Hartford, Conn.

Use postpaid card. Circle No. 104

Portable storage units

Portable small parts bin unit fea-
tures a wheeled dolly. It is particularly
useful for service, maintenance, repair
and assembly operations where it is

MACHINE and TOOL BLUE BOOK

The **Bridgeport**

TURRET MILLING MACHINE

... the "greatest value" in the machine tool market

The "greatest value" is not a slogan coined here in Bridgeport by us . . . it is the term applied to Bridgeport Milling Machines universally . . . by those who use them . . . by those who sell them . . . and by those who are waiting for them.

To those who have "Bridgeports" on order, may we say that we are constantly stepping up our production consistent with turning out highest quality machine tools.

It is most gratifying to us to have others go on record, verbally and in writing, to the effect that "Bridgeport" is synonymous with "greatest value." And it is no accident that this expression should be so universally applied to Bridgeport Millers.

Everything connected with the design and building of these machines has had "value" as the objective . . . value in terms of precision . . . value in versatility . . . value in ability to get maximum utility from the use of the "Bridgeport."

"Bridgeports" are within the reach of any shop, small or large. Small wonder then for the recognition and acceptance of



these time-tried and proved versatile machine tools . . . the "greatest value" in the machine tool market.

Further facts are available through your nearest dealer or through us direct.

Bridgeport MACHINES, INC.

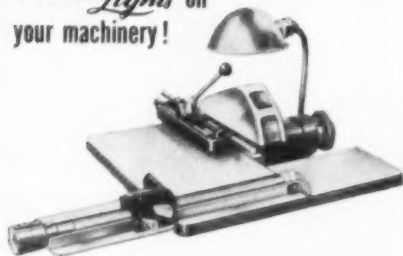
Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

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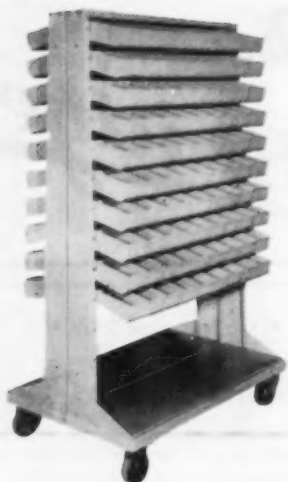
- machine users send for "Bulletin 85"
- machine manufacturers send for "OEM Bulletin"

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advantageous to move the parts to and from the job.

Bin boxes hang on rails, allowing 100% visibility and easy accessibility to box interior. Offered with five sizes of removable bin boxes: 6" front to back, 2¾" deep and widths from ¾" to 11½". Dimensions of the frame of the unit shown are 24" wide x 36" long x 62" high.

Bathey Mfg. Co., Dept. BJ, Plymouth, Mich.

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Brush-sanding drums


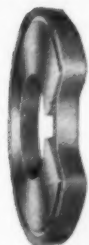






Brush-sanding drums range from 37" to 74" in width for sanding or polishing wide wood and plastic sheets.

A series of fibre brushes spaced around the circumference of the drum back up a series of abrasive strips that feed out from inside the drum and wipe the abrasive against the stock with a smooth resilient action.

This action enables the abrasive to sand down low areas, warps, or sinks without the necessity of grinding down high spots, achieving a uniform scratch pattern across the entire width and

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How to find a
perfect mate!

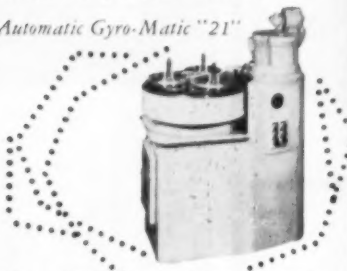
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Valve components, mechanical seals, many other parts require perfect mates... possible by producing surfaces of precision flatness and finish. This quality control is "built-in" around the world... with Spitfire Machines.

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Three basic elements: the human, mechanical and economical... are combined in the Gyro-Matic "21". Simple operation means any production worker can produce precision lapped parts. Micro-inch lapping to .0000116" flatness is standard. Rapid push-button control minimizes man-hours. Where critical parts are standard... so is the Spitfire Gyro-Matic "21".

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2931 N. Pulaski Rd., Chicago 41, Ill.

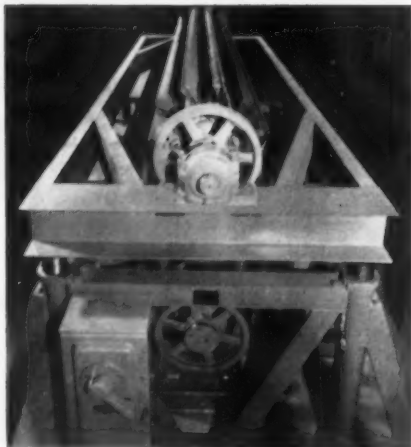
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length of the sheet. Abrasive is fed out of the drum as required.

Merit Products, Dept. KE, Culver City, Calif.

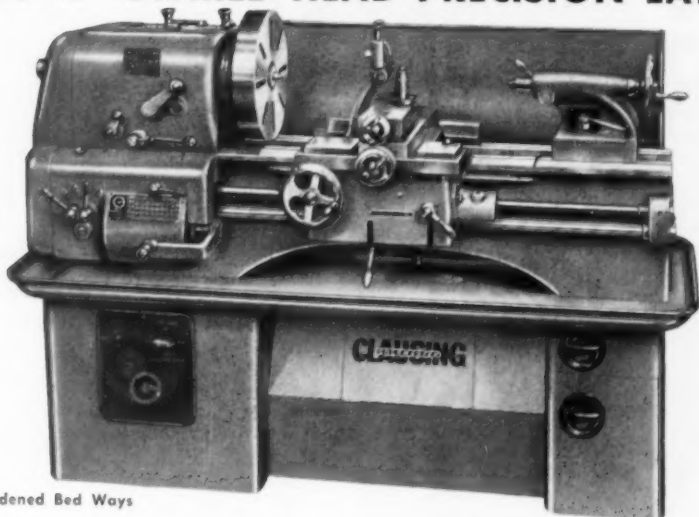
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**Interchangeable anvils
make boring bars
transferable**

Transferability from a turning to a threading or facing operation or from one requiring triangular inserts to an-



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13"-15"-17" GEARED-HEAD PRECISION LATHES



Hardened Bed Ways

BIG CAPACITY—larger spindle capacities (see chart below). Swing for the gap bed models is 28" for the 17"; 24" for the 15"; and 18" for the 13". Between centers capacities: 78" for the 17" lathe; 30" and 48" for the 15"; and 24" and 36" for the 13". Geared-head drive powered by multiple V-belts.

CAPACITY	17"	15"	13"
THRU-HOLE	3 1/16"	2 1/16"	1 1/16"
NOSE TAPER			
KEY DRIVE	L-2	L-1	L-0

HEAVY-DUTY CONSTRUCTION—Massive semi-steel beds with elliptical cross ribbing. Induction hardened, precision-ground V and flat bed ways. Geared-head and quick-change box run in bath of oil, all gears shaved and hardened. Power feeds taken from separate feed rod, lead screw used only for screw cutting. Note heavy-duty construction of tailstock, and of carriage assembly with double-walled apron.

PRECISION PERFORMANCE—built to American tool-room lathe standards of accuracy. Have GAMET MICRON tapered roller bearings . . . with oil flow lubrication . . . most advanced and accurate bearings known to industry.

PROMPT DELIVERIES—through your authorized CLAUSING-COLCHESTER dealer.

OUTSTANDING QUALITY and VALUE—Clausing-Colchester lathes are acknowledged the world over to be the finest value and the most accurate in their class!

PRICES—13" cabinet base models, including motor and controls, start at \$1952; 15" cabinet base, illustrated, at \$2744; 17" model at \$4345. 5 straight bed and 6 gap bed models available, with choice of one or two speed motors.

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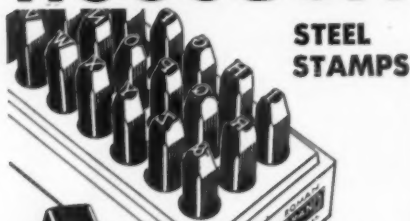
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other requiring round or square throw-aways is provided in micro-adjustable boring bars. The tool change requires only the interchange of one piece—the standard anvil. The rest of the boring bar, including chip breaker clamp and micro-adjustment, do not require any change.

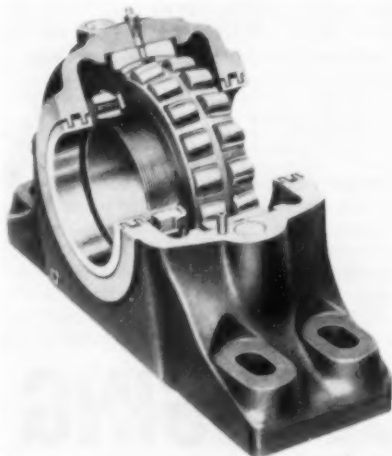
The interchangeable anvils are fitted with carbide anvils to support the throw-away inserts, providing long life and shock resistance for the inserts. Tool grinding is eliminated, machine downtime for tool changes is cut, and scrap reduced.

Wesson Co., 1226 Woodward Heights Blvd., Ferndale (Detroit 20), Mich.

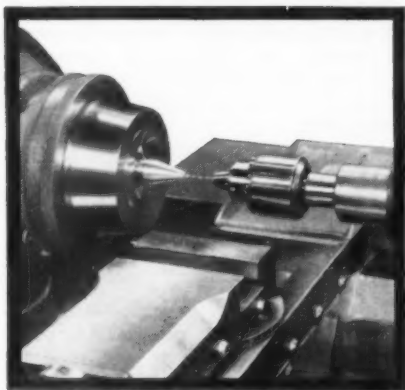
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Spherical roller bearing pillow blocks

Spher-Align pillow blocks have a new mounting feature, Micro-Mount, which makes it possible to seat bearings solidly on shafts quickly and easily. This is accomplished through the use of set screws located parallel to the bore in the adapter nut. After the bearing is snugged up with the adapter nut, adjustment is completed by turning the



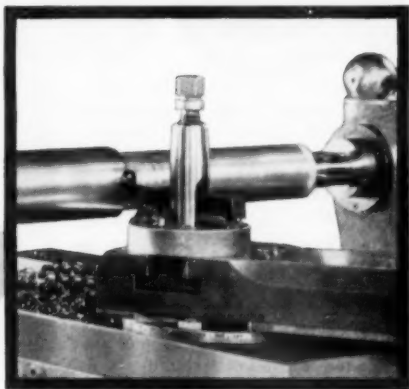
Rivett's 2 for 1 Lathe!



Sensitive...

As An Instrument Lathe

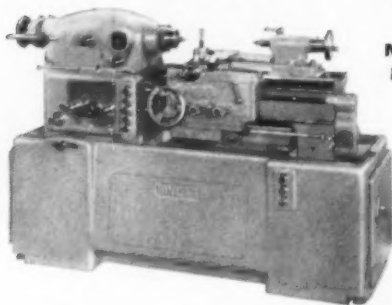
Responds to the lightest touch of the operator. Turns within .0004" in 12" length!



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Full horsepower transmitted to spindle. Takes 1/4" chip with .020" feed on cold rolled steel.



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PRECISION TOOLROOM LATHE**

This lathe has long been recognized as the top tool by master mechanics. Now, its adaptability and usefulness highlight its productivity. As one satisfied user states, "Our toolmakers go to a Rivett first in preference to our other lathes!"

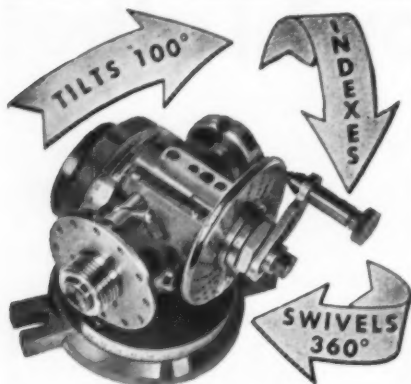
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Dept. MTR-5 Brighton 35, Boston, Mass.



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NICHOLS MORRIS
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 WHITE PLAINS, N. Y.**

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Micro-Mount screws against the locking washer until bearing, adapter and shaft form an integral unit.

Lubricant enters at the center of the bearing and moves outwardly along all bearing surfaces. Both expansion and non-expansion types are stocked in sizes to fit shafts from 2-7/16" to 8" diameters.

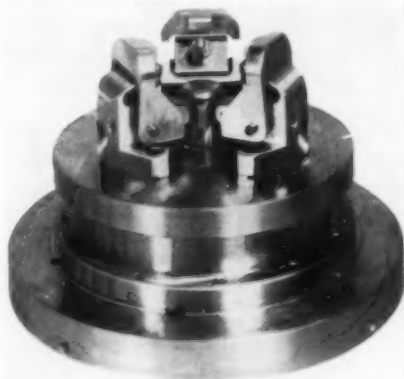
Dodge Mfg. Corp., Dept. HS, Mishawaka, Ind.

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Bevel gear chuck

This bevel gear chuck features a rotating ball locator pin. It has been designed to reduce costs and time in the manufacture of bevel gears. Chuck is a self-contained unit with cylinder and mounting plate.

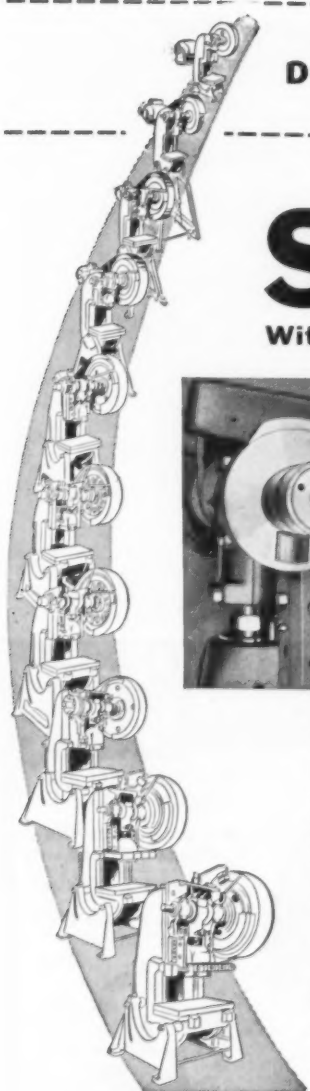
Locating pin has a freely rotating contact ball, automatically adjusting to



a new contact point with each loading and unloading of work. If a ball should wear down to a point of no use, a standard steel ball may be inserted. Locator pin can also be used with chucks of other manufacture.

Splinemaster Products Co., Dept. BJ, 6781 Maxwell, Van Dyke, Mich.

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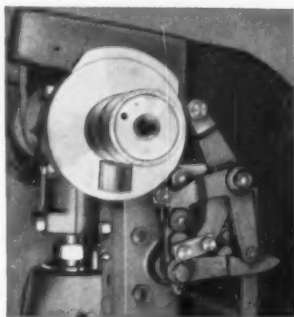


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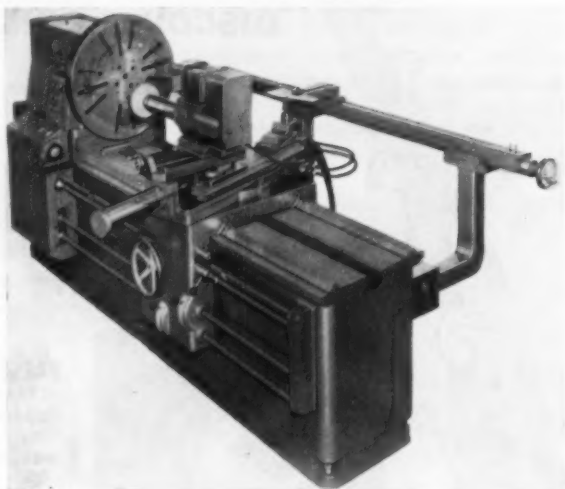
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Equipped with standard flat wheels dressed to very simple radii, intricate contours, both internal and external, are ground automatically on this contour grinder. Variable speed work head also makes polishing and buffing possible. The problem of maintaining accurate contact between the tracer stylus and the template is accomplished through the grinder's three angularity adjustments in a single swiveling or pivoting unit.

Swivelling grinder spindle mounted on the tracer slide will swing in a 180° arc. The tracer slide, mounted "turret-wise" on



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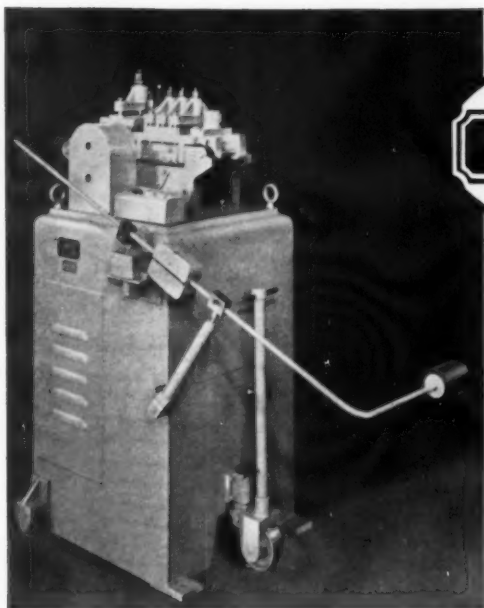
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Model PDS-4 $\frac{1}{2}$ U. S. Power Driven Straightener suitable for material up to 4 $\frac{1}{2}$ " wide, $\frac{1}{8}$ " thick, with variable speed drive, loop control mechanism, and casters for portability.

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Your inquiries are invited. Ask for Bulletin 125-B

U. S. TOOL COMPANY, Inc.
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the carriage, is free to swivel 110° with the tracer stylus. The tracer stylus also swivels (180°) and is mounted on the end of the tracer slide. Precise and automatic grinding of contours inside or outside are possible through hydraulic tracer control.

The head stock range is from center to 39 inches on O.D. work and being equipped with heavy duty bearings will carry workpieces weighing over a ton. Bed of machine is 121-3/4" long and 24" wide, or to customer's specifications.

The grinder spindle will accept 1 1/4" diameter bore and from 3 1/2" to 8" diameter grinding wheels. Standard flat grinding wheels are used by dressing them to the radius of the template in use.

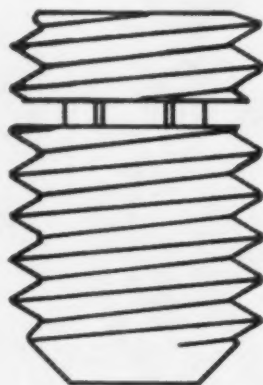
Spindle speeds range on the work head from 0 to 220 rpm and on the grinder head, 3,450 rpm.

Industrial Tool Engineering Co., Dept. BJ, 13849 Keal, Detroit 27, Mich.

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Self-locking socket set screw is actually two screws in one; has been designed to withstand severe vibration and usage. The construction provides a method of wedging screw threads without damage to threads. This pre-



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vents loosening the screw through vibration.

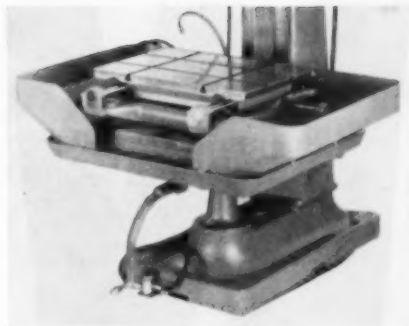
Set screw is re-usable and can be loosened by wrench and reset in any desired position.

Sta-Loc Inc., Dept. BB, 1513 Broadway, Rockford, Ill.

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Large positioning table

Universal positioning table is capable of reproducing any pattern of holes within a 10½" x 12" rectangle. Table is intended for use with Howe and Fant turret drilling and tapping machine but can also be used efficiently on single spindle drill presses and radial drills.



The only part that is special for any given job is the hole location plate

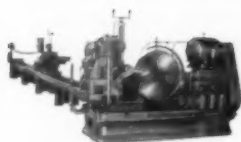
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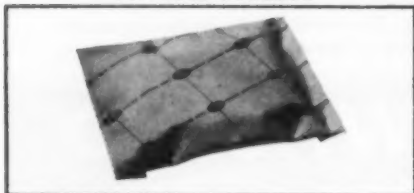
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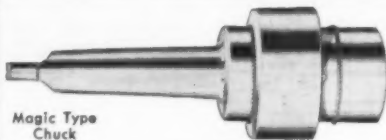
377 FLORENCE AVE., HILLSIDE, N. J.

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which carries the pattern of holes to be reproduced. Either hole location plate blanks or finished hole location plates to customers specifications can be supplied by the manufacturer. Table is easy to set up and can be changed from one job to another simply by substituting a new hole location plate. This can be accomplished in about 15 minutes.

Howe & Fant, Inc., Dept. DR, 20 Fitch St., E. Norwalk, Conn.

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Chuck

THE COLLIS **MAGIC-TYPE** **CHUCKS**

Reduce production costs with Collis Magic Chucks. Now tools can be changed without stopping or slowing down the spindle. Boring, counter boring, drilling, reaming, tapping, etc., can be performed practically continuously.

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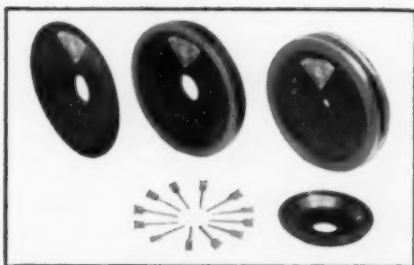
THE COLLIS CO.

Dept. A, Clinton, Iowa

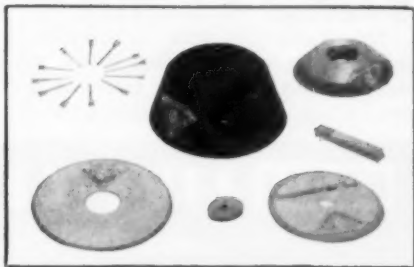
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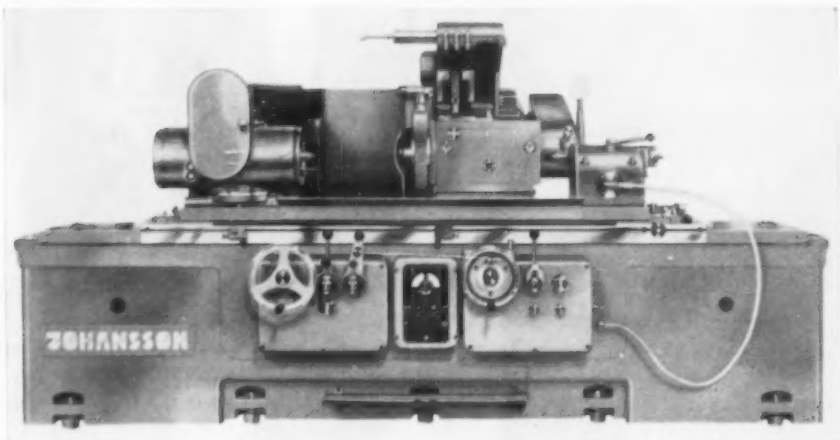


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271-279 GROVE AVENUE, VERONA, N. J.



Swedish Grinder

The Swedish Johansson grinder is available in two types, the 2P for production, and the 2U for toolroom and production use. Center distances are

40", 60" and 80", and the swing over table, 14".

The universal type takes grinding wheels of 20" diam. and up to 3" width, whereas the production model takes up

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to 30" and 4" dia. The table travel is up to 236" per minute. The maximum diameter in chuck is 7"; in collets, 1½". The headstock is gearless. There are 12 speeds, ranging from 20-320 rpm.

The wheel head swivels to allow simultaneous diameter and end face grinding by profiled wheels. The head stock is rotatable through 360° and can be used at either right or left hand end of the table.

The manual and automatic feeds may be operated simultaneously. Consequently, any diversion from the true dimension, due to wear of the grinding wheel when grinding a series of workpieces, can be adjusted without releasing any stops.

For series production, the machine can be equipped with an electrical, hydraulic attachment which automatically switches from normal rate of feed to fine feed at a predetermined point. At

the end of the fine feed period, a predetermined finishing run is initiated, after which the grinding support automatically returns to its original position.

Homestrand, Inc., Dept. DL, 9 Addison St., Larchmont, N.Y.

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Chilling machine for wire testing

Model U 70-6 chilling machine for testing stability of electric wire insulation subjects the insulation to stresses at sub-zero temperatures. The unit includes an air circulator in the door, observation window and lights, as well as fittings for holding a manually rotated mandrel shaft which supports weighted lengths of wire. It has temperature adjustment from -10 to -80°F, and a thermal capacity of 200 BTU/hr at -70°F, operating under normal ambient conditions.

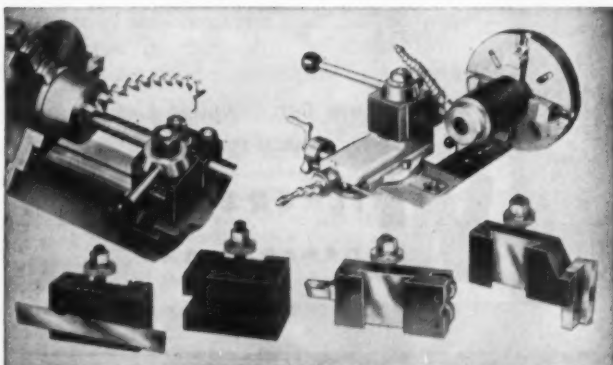
Constructed of 14-gauge galvanized

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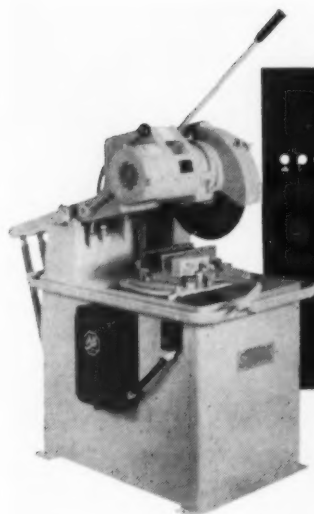


ALORIS TOOL CO., INC.

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MACHINE and TOOL BLUE BOOK



**...Cuts hardened tool steel
Increased production over
5 TIMES***

**Model M75 "Heavy Duty" cut-off machine.
Capacity: 2½" solids, 4" pipe and structurals.**

A large Detroit tool shop formerly teamed a power hack saw with a band saw for cutting hardened tool steel.

*These two machines were replaced by a single model M75 cut-off machine. *Result . . . Model M75 increased production over 5 times.*

Cost data proves tremendous economy of Stone machines compared to other methods.

- Cuts any metal — ferrous or non-ferrous — in 2 to 4 seconds per sq. inch.
- Used for cutting bar stock, pipe, tubing, structurals, etc.
- Leaves mill-like finish with tolerance less than $\pm .005$; reduces the need for further machining.
- No change of characteristics or hardening of stock.

Exclusive Features by Stone

- Geared-in-head motor delivers maximum power to cutting edge for greatest efficiency.

- Self-centering vise presents least arc of contact for faster cutting, longer wheel life.
- Vise plate calibrated in degrees permits speedy changeover from straight cutting to angular cutting up to 46°.

Optional Features

- Semi-Automatic Power Stroke provides simpler operation, minimizes operator fatigue; gives up to 25% longer wheel life.
- Oil Mist Spray attachment for cooler, easier cutting and increases saw blade life up to 400% on non-ferrous materials.

Machinery by Stone includes a complete line. Let us help you select the equipment which will enable you to realize greater profits on your particular operations. Our representative will gladly discuss your requirements with you. No cost or obligation; simply write or phone.



Stone Machinery Company, Inc.
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"Cut-off machinery by Stone . . . represented in every major industry throughout the world."

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This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, inches	Opens inches	Weight Pounds
1D	3½	4	12½
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steel, the chamber area is 12" long x 12" wide x 72" high. It is insulated by four inches of Santocel "A".

Air circulator with an outside motor blower keeps inside air re-circulating at all times. Maintaining circulation of this inside air in the chamber prevents stratification of warm air. Inlet and outlet ducts enter directly into the chamber area.

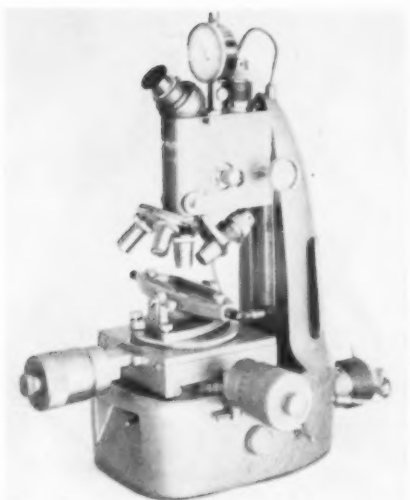
Cincinnati Sub-Zero Products, Reading Rd. at Paddock, Cincinnati 29, O.

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Toolmakers', metallurgical microscope

Model TM combines in one stand a versatile toolmakers' microscope for precise shop measurements and a complete metallurgical microscope for the high-power examination of metal grain structure. Magnification range is 30-400 power (and higher with the aid of accessory optics).

The instrument gives direct readings to 0.0001" in three dimensions by means



of large micrometer drums which move the stage and a dial indicator which measures depth by optical contact with the specimen. Other features include three separate light sources for sub-stage, overhead and vertical illumination; combination rectangular ball bearing stage and circular rotary stage; inclinable tool holder; transformer built into base; coarse and fine focusing.

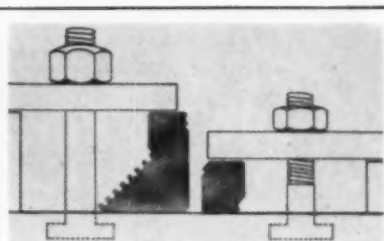
Unitron Instrument Div., United Scientific Co., Dept. DL, 204 Milk St., Boston, Mass.

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Form dresser

The Contour'Rex is a compact form dresser which forms grinding wheels with a one-to-one template ratio. It can be fitted permanently or temporarily to most types of standard grinders. With normal care and skill of operation, dresser will reproduce the template form within .0002 in. at all points of the form.

It consists of two basic units—the dresser and tracer unit, and a "rectifier" unit which corrects errors occurring



MERMOD SET-UP BLOCKS

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in the dresser unit form wear of the diamond. The rectifier is said to be the secret of the accuracy of the dresser, combining a checking and truing of the tracer-diamond relationship.

The templates are one-to-one with the form to be dressed and can be made on common shop tools using commonly available materials such as worn-out power hacksaw blades. Die-makers can use either punch or die sections as templates for the mating part. The unit permits any amount of clearance between punch and die.

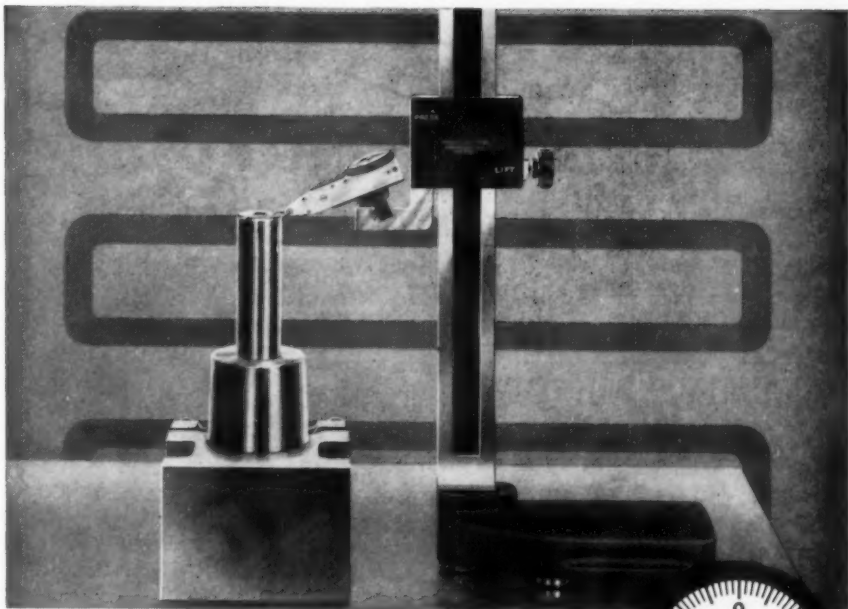
Form-All Mfg. Co., Dept. RS, 364
 Glenwood Ave., East Orange, N.J.

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Electronic gage units

High-speed electronic gage team consists of a small electronic pickup cartridge (Electrojet) for incorporating in new and existing gages and precision instruments and a portable electronic amplifier (Accutron).

The Electrojet is small, compact, easily mounted. It requires no pickup calibration, being set by locating in setting fixture only. It can be used with the full range of Accutron amplifica-



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NOW ALL CHECK MASTERS are Non-Magnetic, Lower Priced

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Now, all CHECK MASTER Test Indicators are non-magnetic and gold in color to identify their supreme accuracy even in the strongest magnetic fields. They are the finest instruments of their kind available, yet all six improved, non-magnetic models are now lower priced. Ask the Man-from-Standard or write Standard Gage Company, Inc., for Bulletin giving full details.



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Gage Material .040 to .125

Pin Diameter .101 to $\frac{1}{8}$

Lengths to 120"

SEMI-OFFSET

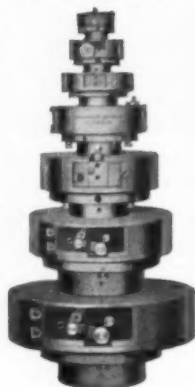


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in 9, 12, 16, 20, 24,
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tions from 1000 to 1 up to 40,000 to 1.

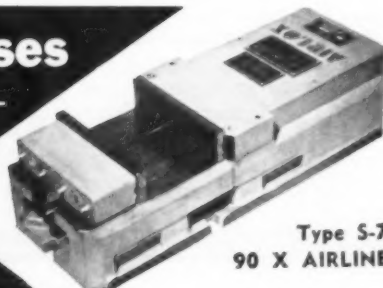
The amplifier has dual amplifications that can be switched from one to another without requiring realignment of the indicating meter mechanism.

Cartridge is transducer type, $\frac{3}{8}$ " in

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THREAD TOOL DIV.

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diameter by 1-7/8" long. It has a total stylus travel of approximately .110". Pre-travel is approximately .005". Depending upon amplification, effective gaging travel is up to .004" with an over-travel of approximately .100". A positive stop at the end of plunger over-travel protects the cartridge against damage. It is sealed at both ends to

prevent foreign particles from affecting the operation of the stylus.

Amplifier operates on 110 V, 60 cycle AC. It is unaffected by line voltage fluctuations from 65 to 150 volts. Electronic circuit has built-in voltage compensation that permits extra-fast indication without drift or shift in amplification.

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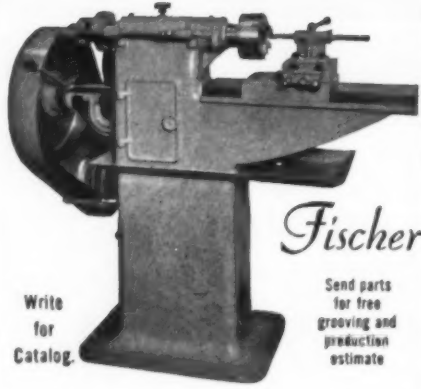
Broaching Fixture Features Automatic Handling and Ejection

Self-contained, air-powered broaching fixture includes automatic broach handling and part ejection devices to provide the features of semi-automatic loading. In addition to the tandem air-hydraulic cylinder that pulls the broach through the part, the fixture has a second air cylinder which operates a broach retriever mechanism, a third operates a part ejection device.

A part is loaded on a locating plat-

form, and a cycle start valve is operated. Then the part is broached in a fully automatic cycle, with the part automatically ejected after broaching.

The unit illustrated broaches a round hole in each of two 3/4 in. dia., 1 in. long bushings that are pressed in a die-cast electric windshield wiper bracket. The in-line bushings are about 4 in. apart. The holes are broached to a .001 in. dia. tolerance and must be in



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Send parts for free grooving and production estimate

ESTABLISHED 1900

FISCHER MACHINE CO.
ELEVENTH & WOOD STS. • PHILADELPHIA 7, PA.

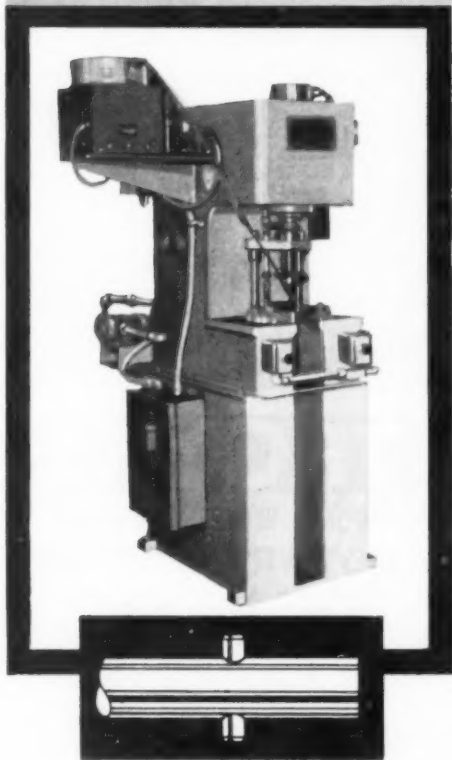


... OIL GROOVERS

The FISCHER No. 1 Oil Groover cuts a wide variety of grooves in bearings up to 8" in length and up to 5" inside diameter. A few simple settings permit you to cut continuous, relieved, straight or spiral grooves at any angle from parallel to perpendicular to the work. Grooves may also be cut in shafts, housings, etc. This machine will slash grooving time and deliver continuous profitable production in your shop. It will pay to find out what it can do on your grooving jobs.

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Acme Hydraulic Bench Press Performs Assembly Operation



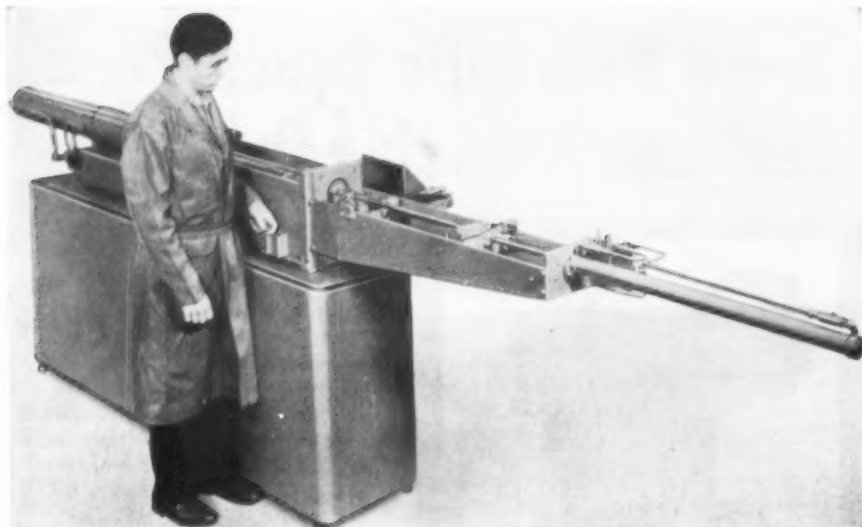
Split Pin Assembled in Shaft

A standard Acme BA4-A Hydraulic Press is equipped with a vibratory feeder which automatically feeds a small split pin into a pusher unit attached to the end of the press ram. This unit then travels downward until it contacts a second part which is a small shaft like part manually placed into a receiver fixture on the press table by the operator. The shaft is rotated in the fixture until an aligning detent locates the hole into which the split pin is to be pushed . . . When the ram pusher contacts the shaft in the fixture, it stops and a plunger continues pushing the split pin into the longer shaft until it comes to a fixed and predetermined stop which assures that the split pin is properly located in the longer shaft. This assembly forms part of an automatic transmission. Assembly rate is approximately 480 per hour. This press complete with tooling was recently supplied a customer in the automotive field.

Contact us on your Broaching, Broach Tooling and Press Problems.

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— MILAN, MICHIGAN —

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line within 0.0005 in. A combination
broach-burnisher tool is used in an

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The part is deposited on the loading

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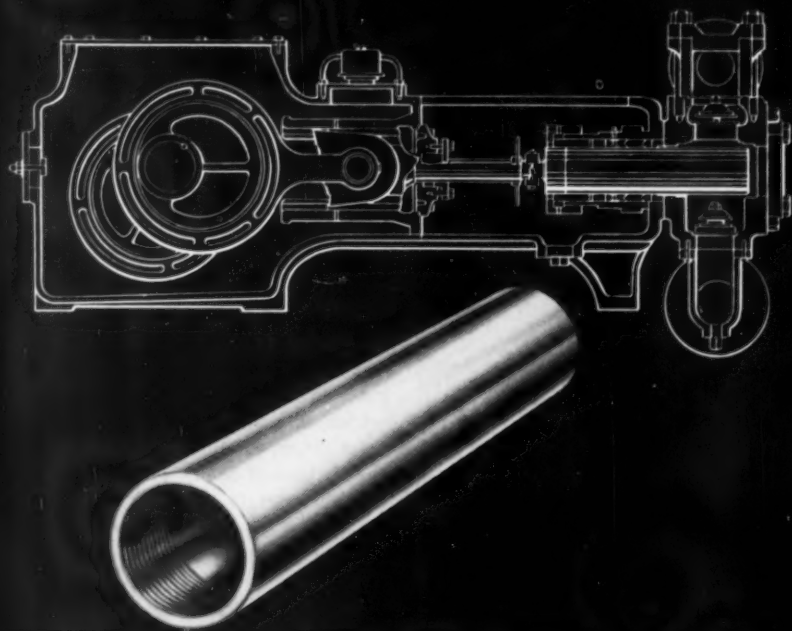
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MACHINE and TOOL BLUE BOOK



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Alloy Steel drastically reduced rejections on the finished part.

Once again Mr. Tubes proved conclusively that final cost—not initial cost—is the measure of good tube fabricating practice. If you're concerned with costs as well as producing a good finished product, get in touch with Mr. Tubes. He can help you save money.

The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



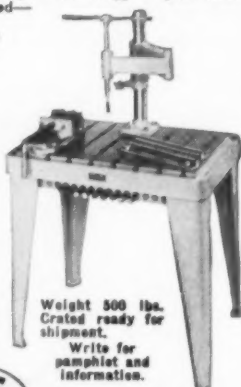
TA-6100-M5

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Results have proved that once this tapper is in your shop or tool-room and you find 70% of your free hand tapping time saved—It will stay there! The new Allman hand tapper has these advantages:

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platform and the cycle start valve is pressed by the operator. The broach retriever cylinder advances the broach puller through the hole to be broached and into the automatic broach pull head which is guided by linear ball bushings. The pull head draws the broach through the part; the loading platform is tipped up by its cylinder control, and the part is ejected into a chute.

With the platform up, the pull head returns the broach into the retriever which carries it back to clear the platform. Then the platform is lowered and the fixture is ready for the loading of another part to be broached.

National Broach & Machine Co., Dept. BJ, 5600 St. Jean Ave., Detroit 13, Mich.

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.0003 HOLE LOCATION IN 1 MINUTE

EDGE FINDERS

\$2.50
NEW

POSTPAID
except C.O.D.

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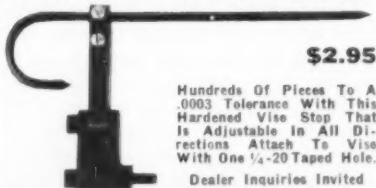
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200 Dia.

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MACHINE and TOOL BLUE BOOK

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breakage of teeth occurs.

The see-sawing movement is per-



the new **LOW PRICED** **OMEGA** **JIG BORER** with the **Giant Sized Table** **20" X 32" WORKING AREA**

- 16 Spindle speeds from 35-1500 rpm.
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PRICE fob, New York **\$8600.00**
Optical measuring system with overall accuracy of .0002" (available at additional cost)

AMITool COMPANY

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formed by a special gear. When cutting thin profiles, this motion would not offer special advantages. In such cases, a lever permits disconnection of the movement.

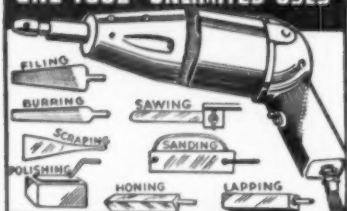
Features automatic stop, coolant pump, three cutting speeds. For straight or mitre cuts. Standard cutting range: round material to 6", flat material to 9" x 6". Motor capacity, ¾ hp. Price \$615.

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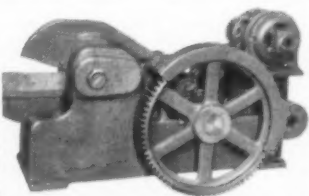
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Model L.A.
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Automatic
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This unit is regularly furnished with a flanged quill and slotted spindle for close coupled, multiple spindle, precision tapping heads. For single spindle tapping, it can be furnished without the quill flange, and with an A.S.A. 1" dia. adjustable adapter for a No. 1, 2 or 3 Morse, taper.

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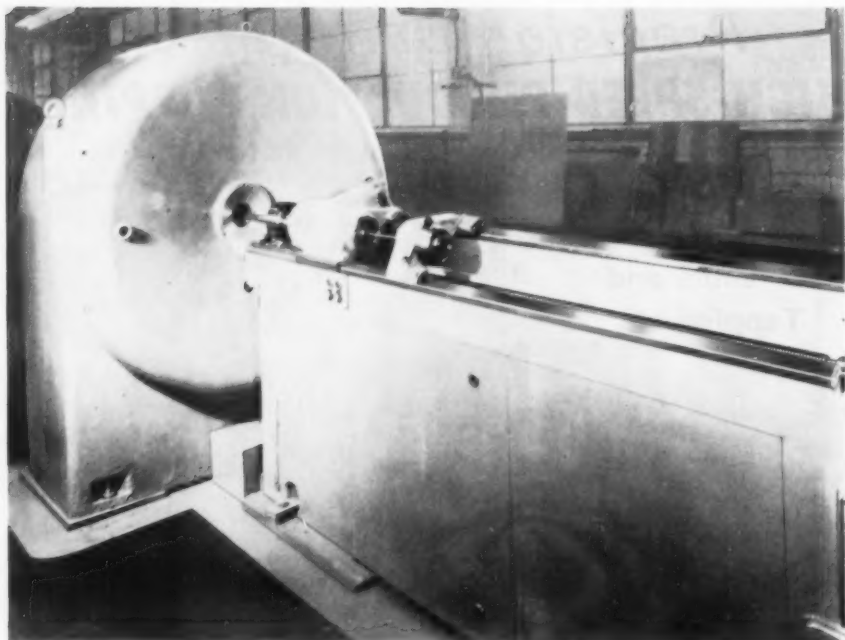
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Cold Forming Machine

The Appel process comprises cold forming through kneading or plasticizing materials at a very low temperature, probably never in excess of 150°. The machine transforms the original shape of the unworked material into the finished product shape by the action of the forging elements which, under

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Has a graduated swivel base, held in place by a center pin and two bolts.

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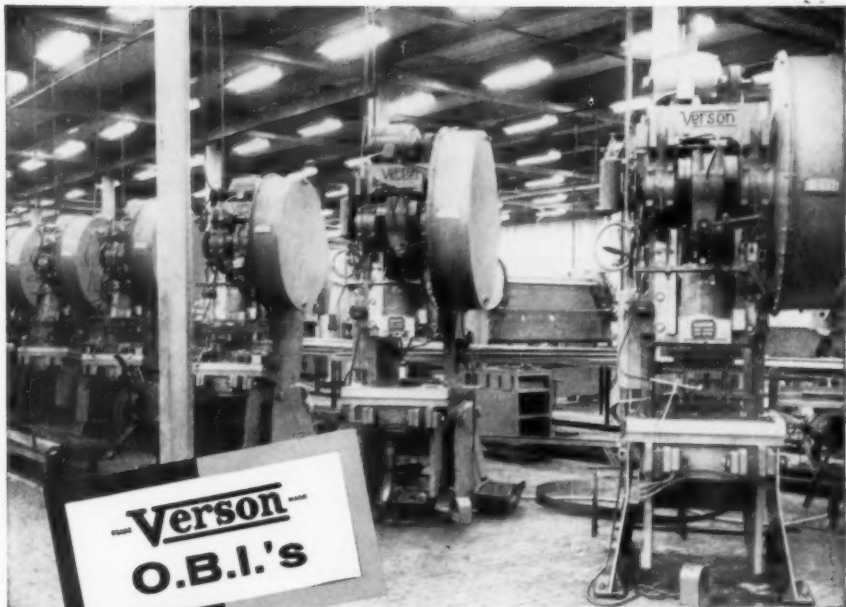
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8-10 micro-inches, although a finish of somewhat better than 2 micro-inches can be obtained.

Tubular parts with a cylindrical outside diameter where the bore has a contour, such as internal splines or square holes, are relatively easy to make. Both ferrous and non-ferrous materials can be cold formed by this process as long as the materials are ductile. Various types of carbon and

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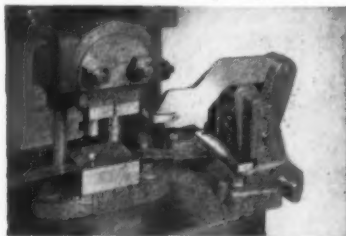
The three basic rules for high-speed forging have been incorporated in this eccentric-operated prism machine: radial stroke with radial acting balanced forces; no impact forging, but time controlled kneading of the material; controlled movement of hammer elements, eliminating rebounding.

The No. 4 Fellows-Appel Cold Forming Machine consists of a forging unit and feeding unit joined together. The work is fed into the forging unit where the forging dies are simultaneously forced onto the work in a direction radial to its center. The rate of feed is dependent upon the amount of deformation per stroke. The number of strokes, the feed and the rate of rotation of the work are changeable. The selection of these is determined by the type and the physical properties of the material being formed, its dimensions, the required deformation and the shape of the deforming section of the tool-set.

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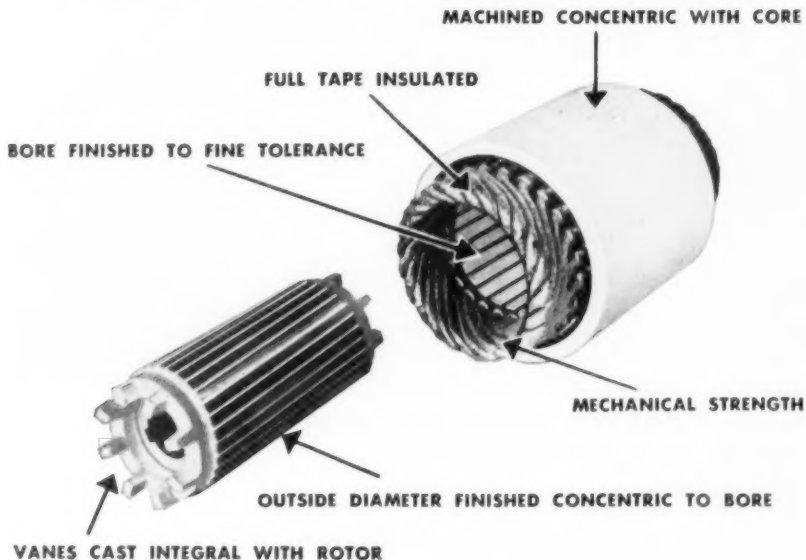


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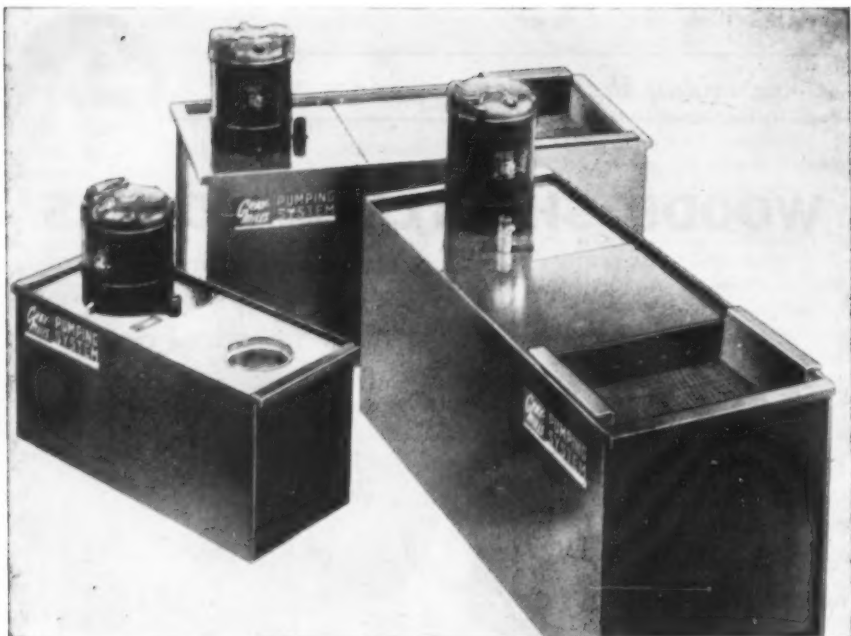
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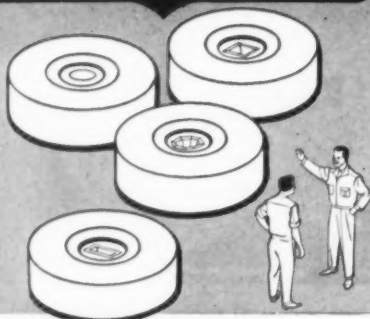
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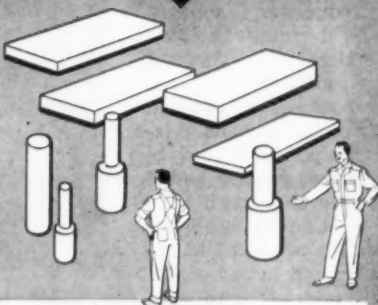
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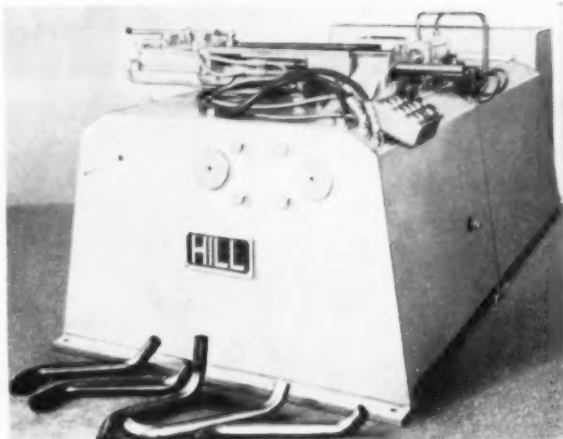


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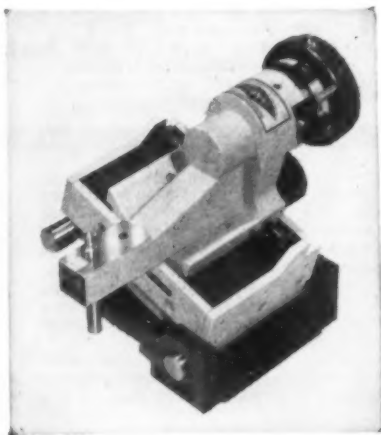
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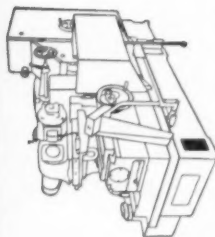
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Production

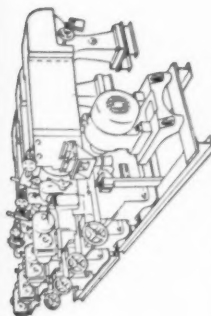
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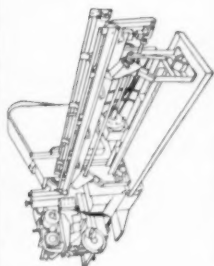
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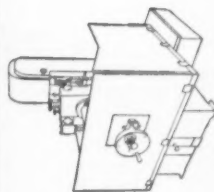
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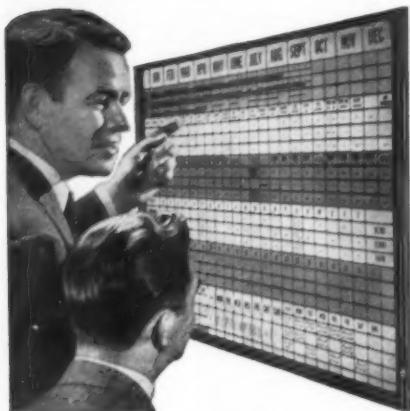


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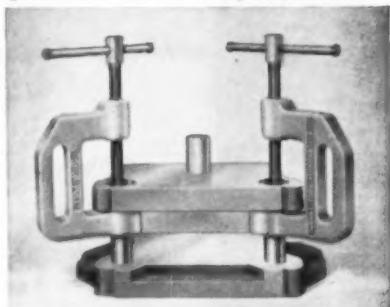
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assembly move with the tubing as it is bent, thus avoiding die marks and wrinkles in the bent parts. Travel of the press ram and wiper die assembly can be controlled in sequence to produce bends of different angles in a single part in an automatic bending cycle.

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O.D. 3/32" to 13/64"
Lengths 1/4" to 3/4"

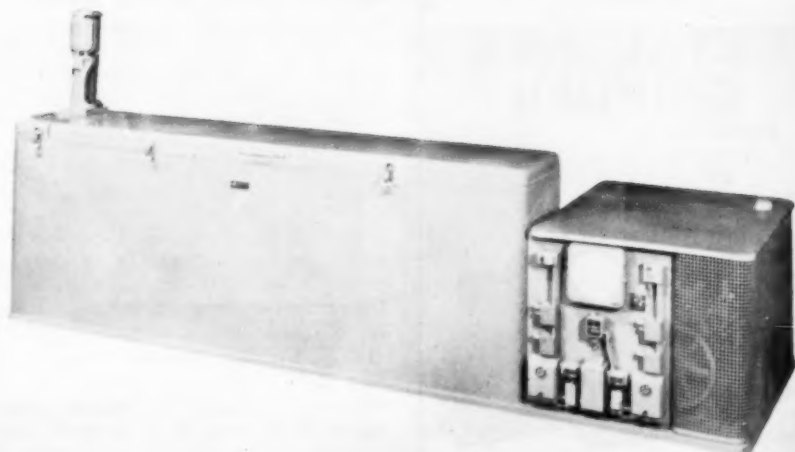
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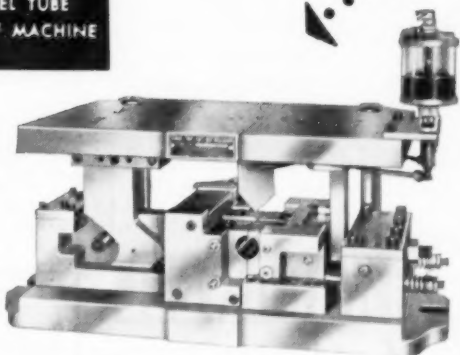
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LENGTHS of $\frac{1}{2}$ inch or more are accurately cut to $\pm .010''$ with each stroke of press—actually less than $\frac{1}{2}$ of a second or faster than any other known method. In addition to being rapid and precise, the Vogel Cut-Off also cuts clean with a minimum of burr and distortion. Many thousands of cuts can be made before shear blades require sharpening.

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Ask for sample showing how clean-cut your tubing can be sheared with this machine.

VOGEL TUBE CUT-OFF MACHINE



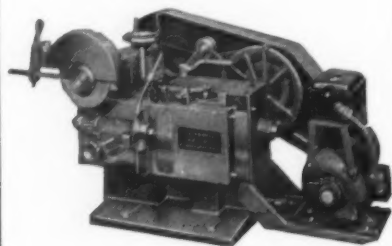
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TOOL AND DIE CORPORATION
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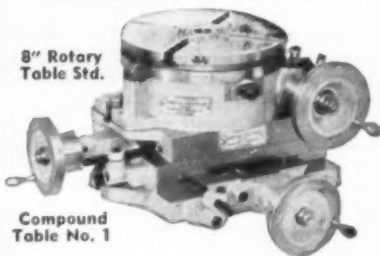
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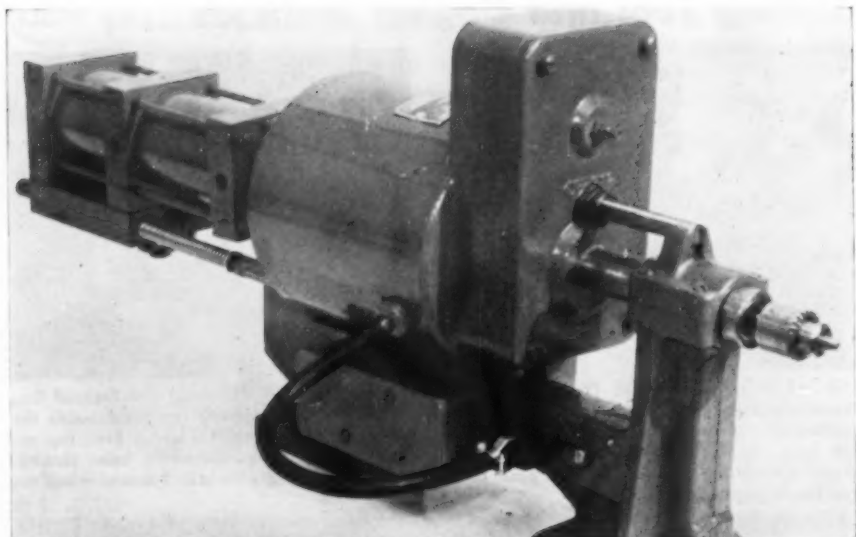
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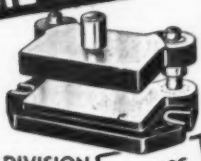
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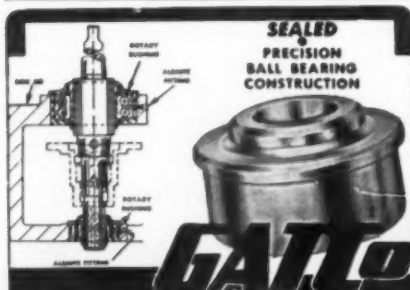
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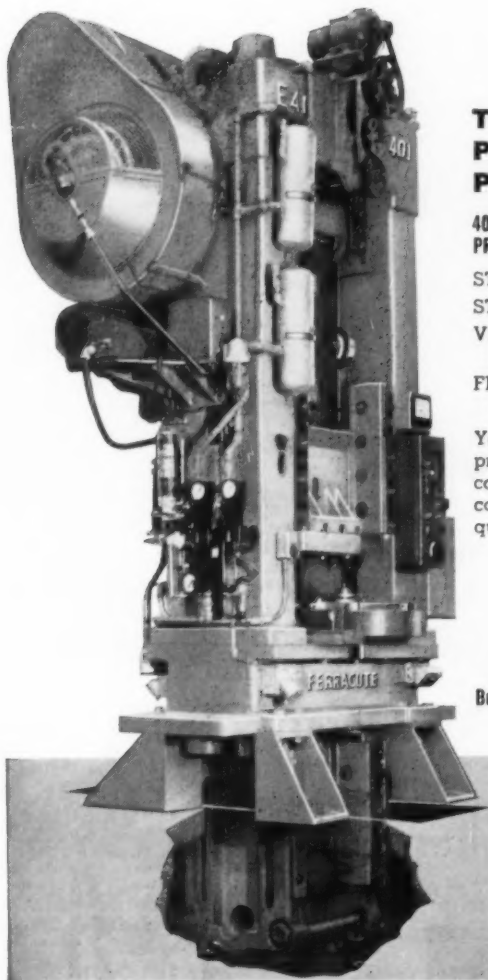
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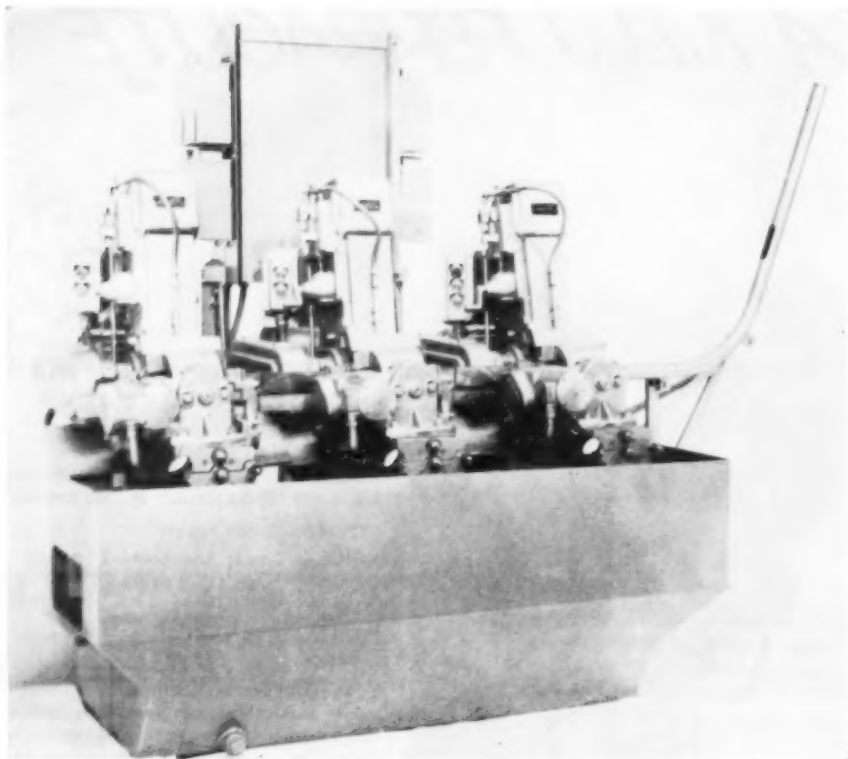
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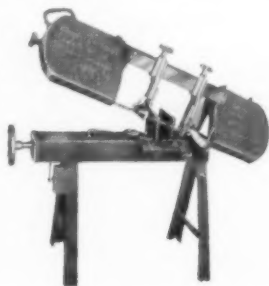
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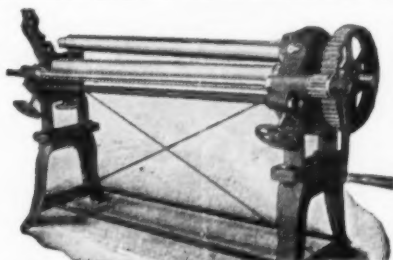
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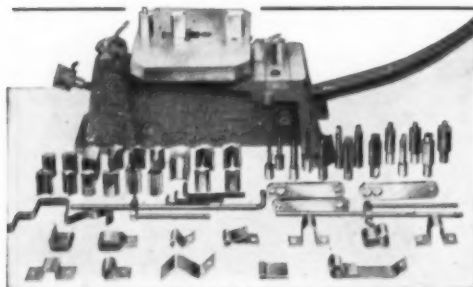
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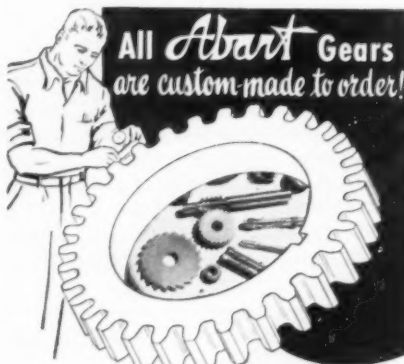


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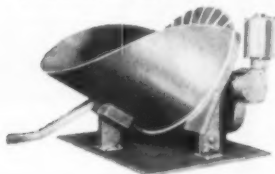
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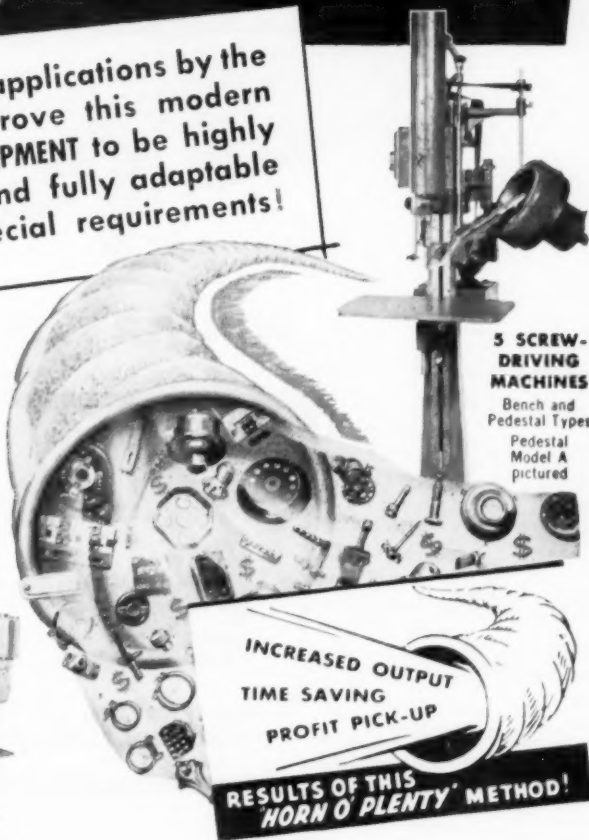
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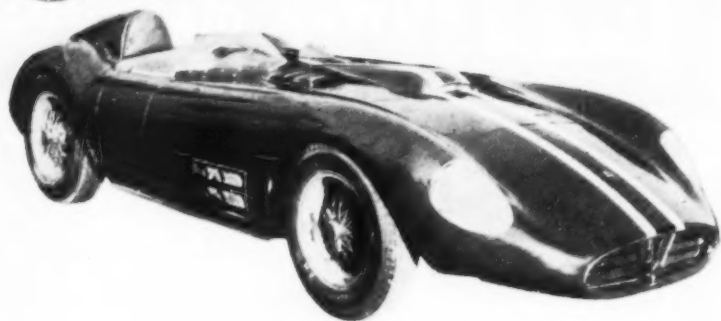
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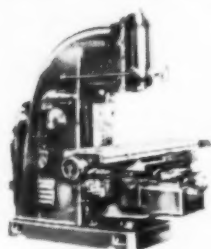
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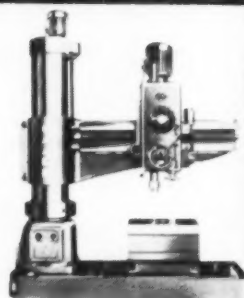
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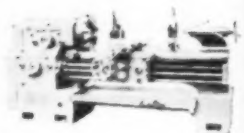
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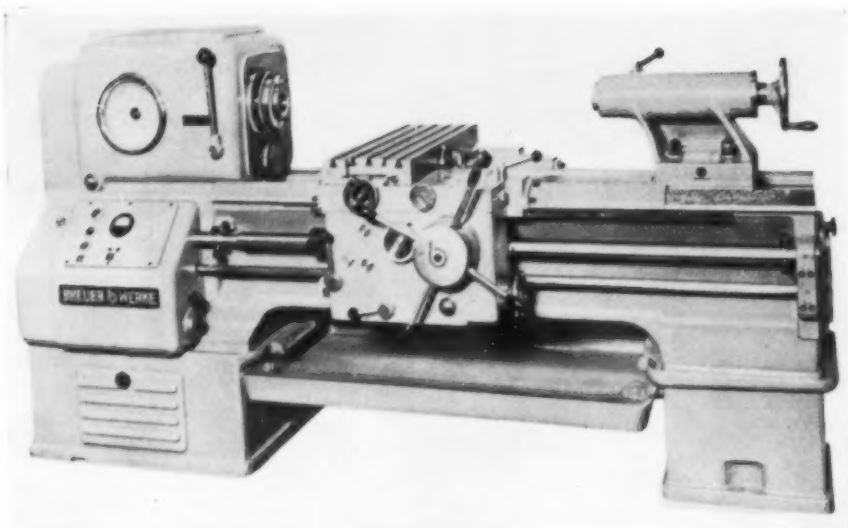
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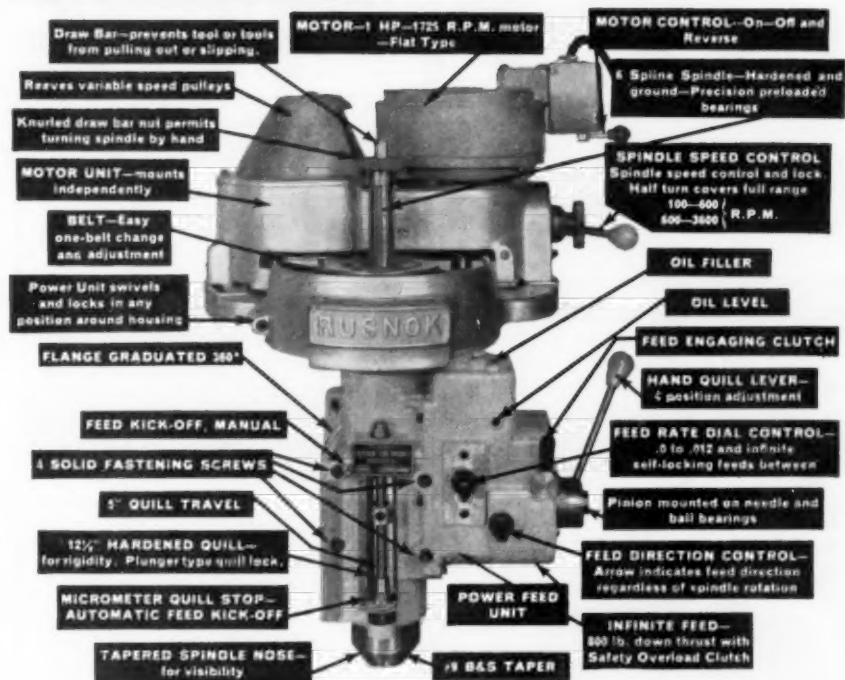
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1/4"	.70	.90	1.10	1.30
5/16"	.80	.90	1.10	1.40
5/8"	.80	1.00	1.20	1.50
1/2"	1.00	1.20	1.40	1.70
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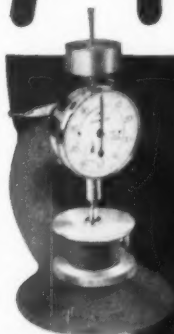
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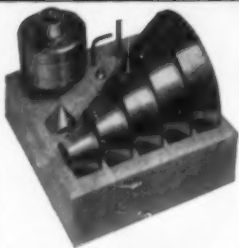
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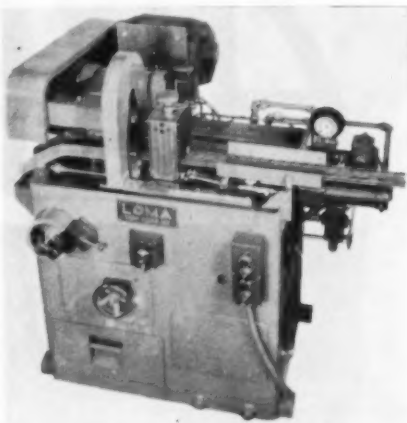
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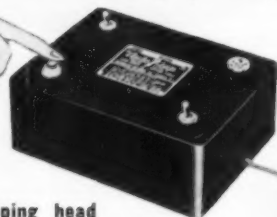
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the automatic lead screw tapping head

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LEAD SCREW TAPPING TOOLS

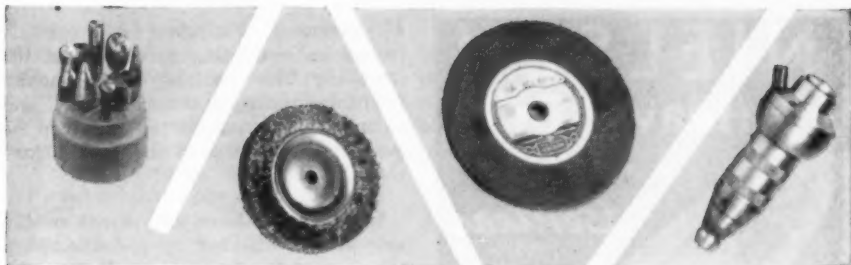
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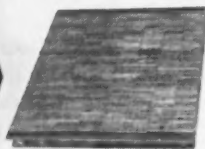
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ball and roller
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The up-and-down movement of the saw arm is effected by a combination oil-air system of cylinders. During the feed stroke, oil is forced out of the hydraulic cylinder at a rate controlled by a steplessly adjustable flow control valve. In this manner, the feed rate can be selected to obtain the ideal working conditions for any cutting job, and excessive loading of the sawblade is avoided. Irrespective of the feed rate during the cutting stroke, the return stroke of the saw takes place at a constant fast speed.

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The entire sawing cycle—stock advance, clamping, saw feed, saw return, clamp release and stock discharge—is automatically controlled and interlocked. A single pushbutton starts the entire cycle, and there is no danger of malfunctioning due to lack of operator attention.

The advance of the stock along the feed-in table is generally obtained by a motor-driven belt conveyor. Adjustable lateral guides keep the stock in a straight line perpendicular to the sawblade. Once the tubes or rods con-

tact the length stop, the belt movement is stopped by means of an air clutch. The advance movement starts again automatically once the cut is completed and the clamps have opened. The length stop is mounted on the piston of a double-acting cylinder, and its exact position corresponding to the required cut-off length is obtained by vernier adjustment.

Saw handles cut-off lengths up to 12 in. The sawblade operates at a high peripheral speed of about 10,000 ft. per minute and oil-air mist lubrication can be applied when required by the cutting characteristics of the metal.

Loma Machine Mfg. Corp., Inc., Dept. BB, 116 East 32nd St., New York 16, N.Y.

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by HARTMANN

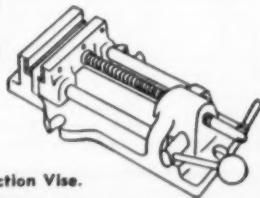
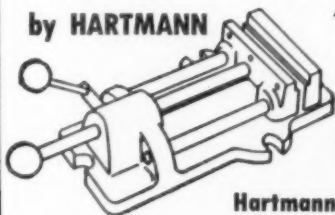
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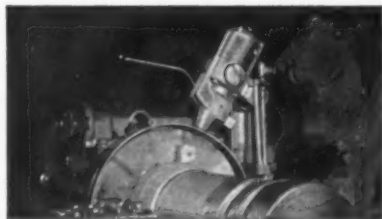
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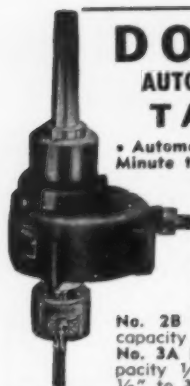
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You can put the advantages of the Fen Automatic Wrenches to your work right in your own shop on machines already in operation, or specify them on your new standard or automatic machines.

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DORMAN AUTOMATIC REVERSE TAPPERS

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 $1\frac{1}{3}$ h.p.
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Carbide burs produced automatically

Automatic bur grinders are turning out carbide burs faster, more economically for the Atrax Co., Dept. DR, Newington, Conn. Grinders are actu-



ated by cams, automatically grind carbide blanks to size, shape and with the specified number of flutes.

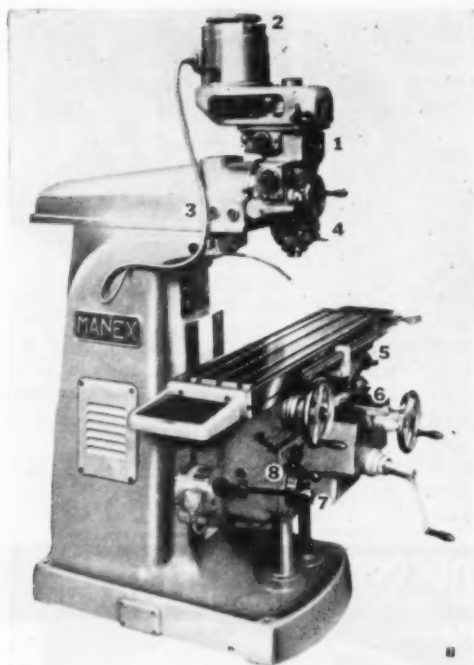
Wet grinding with a diamond wheel under water coolant permits each flute to be ground from the solid in one pass. This controlled fluting produces uniform cutting edges.

Atrax automatically ground burs are made of the same carbide quality and hardness as before. Automation is claimed to have made possible superior finish, sharper cutting edges and longer life.

Automatic bur grinders were built by Atrax for manufacturing their line of standard carbide burs. The machines are not for sale.

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MANEX *High Speed* Vertical Milling Machine



ALL CASTINGS ARE
MADE OF MEEHANITE

- 1 ALL GEARS OF CHROME
NICKEL ALLOY
- 2 Magnetic Clamp
- 3 Cam Lock
- 4 Backlash Compensation
on Longit. and Cross Feeds
- 5 Automatic Lubrication
- 6 SADDLE 30" Long
- 7 Rapid Traverse
- 8 12 Selective Feeds Are
Changed While Table
Is In Motion

SPECIFICATIONS

TABLE	36" - 42" - 48"
Longitudinal feed	26" - 30" - 38"
Width	10"
Cross feed	10"
8 Spindle speeds	75-2850 r. p. m.
3 automatic feeds	.0015" - .003" - .006"
Quill travel	5"
Head traverse travel	13"
Motor for Spindle	2 H. P.
Motor for table feed	½ H. P.
Saddle	30"

Electro-pump	¼ H. P.
Maximum distance spindle to table	18"
Maximum distance spindle to column	25"
12 DIAL TYPE table feeds	7/16" to 19 1/8"
RAPID TRAVERSE	100" p. m.
Micrometer depth stop graduated in	.001"
Large dials graduated in	.001"
Brake inside pulley stops spindle instantly	
Motor and pulley dynamically balanced.	
Net weight (approx.)	2750 Lbs.
Base	40" x 25"

MANEX MACHINERY CORPORATION

204 Central Park South

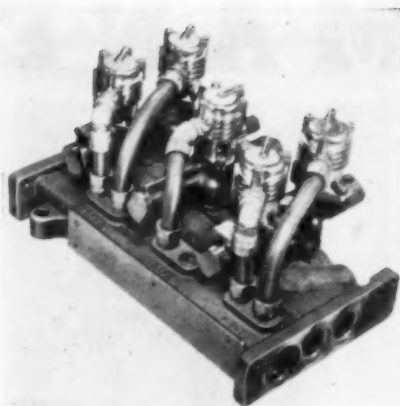
New York 19, New York

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Multiple valve manifold

Cast aluminum manifold designed to afford economical and efficient multiple mounting of Speed King two-, three- or four-way valves in any desired combination is available in 2- and 3-station types. It has full length inlet and exhaust ports, both 1 in. npt, common to all valve stations. Electrical wiring is run through a 1 1/4 in. npt conduit passage, with one access cover for all stations to simplify wiring. Pilot solenoid leads are enclosed in dirt- and moisture-proof flexible conduit. The manifolds are designed with side or bottom cylinder porting to facilitate piping. Holes for mounting the manifold and valve assembly are also provided.

Manifold can be adapted to any type of control valve application. Combinations of single or double solenoid Speed King valves can be mounted at any station on the manifold. Remote operated, speed controlled and oil pilot valves also are suitable for installation.



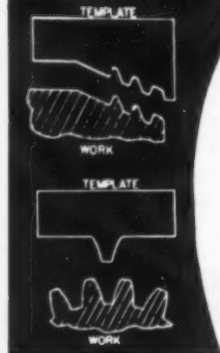
To afford uniform mounting of 2, 3, 4, 5, 6 or more valves, manifolds can be ganged by bolting the assemblies together, end-to-end. O-rings seal inlet, outlet and wiring ports.

Valvair Corp., 454 Morgan Ave., Akron 11, O.

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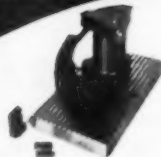
the Contour-Rex DRESSER and RECTIFIER

**NEW WAY TO PRECISION—FORM GRINDING
WHEELS USING ONE TO ONE TEM-
PLATES AND TOTALLY NEW
RECTIFIER TO CORRECT
TRACER FOR WEAR
OF DIAMONDS**



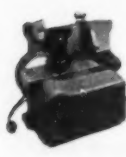
Dressing unit, \$230.00

- Combines platen and diamond head 3 diamonds and 3 tracers. Diamonds not included.
- Form dresses **HARD** as well as soft wheels without removing work from grinder.
- Smallest inside radii and fillets limited only by point of diamond.
- Prices subject to change.
- Prices F.O.B. East Orange, N.J.



Rectifier, \$650.00

- Combines checking and truing of tracer and diamond relationship.
- Tracer rectified by half-rotating motion of diamond head. Tracer ground against small grinding wheel directly below.
- Checking done with similar motion on side of indicated square easily checking truing to accuracy of .0001".
- Master square and holder for checkers included.
- One rectifier used for several dressers.



FORM-ALL MFG. CO.

Providing: "The Engineering Service for ALL Form Grinding"
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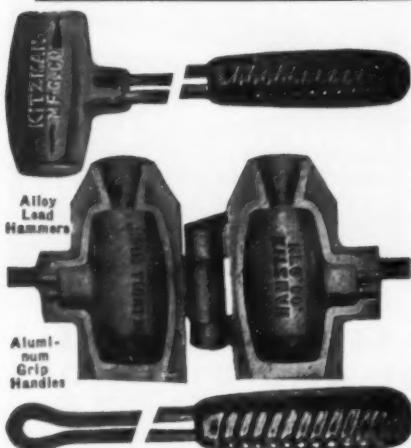
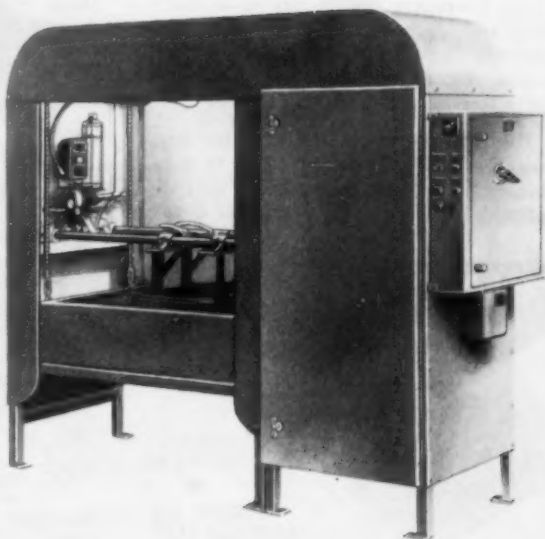
MACHINE and TOOL BLUE BOOK

Parts Deburring Machine

The Reciprotron was designed for deburring, polishing, microinch finishing and generating radii on machined parts. The reciprocating action operates on the principle of fixturing parts in racks, which are placed into quick-releasing rack holders.

The fixtures and parts are reciprocated by two self-lubricating driving shafts powered by a 3 hp motor with an adjustable variable speed of 90 to 380 strokes per minute.

A pan containing the proper abrasive or polishing media and solution raises to submerge



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1, 2½ and 3 lb. sizes—order your alloy lead hammer requirements from your machine tool supply house

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New York 16, N.Y.

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the reciprocating fixtured parts in the media for a predetermined running cycle. Fixturing design prevents marring and nicking of the parts. The necessity of unloading and loading media, water and compound after each cycle is eliminated.

The Model 50 is fully automatic, measures 94" x 36" x 84". Size of machine may be varied to custom specifications. The machine is suited for auto-

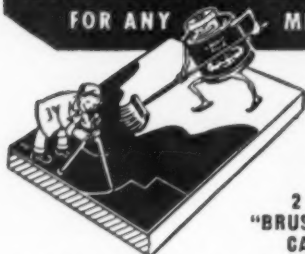
mated production; one operator can handle three machines.

Metal Parts Sales Co., Dept. RS, 161 Delancey St., Newark, N.J.

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The ROUSE HAND MILLER is a widely used, inexpensive, high speed, ball bearing, motor driven machine for handling light cuts in brass, aluminum, steel, plastics, and other materials—fast, accurately, and at very low cost. Only \$110.00*

Fixtures (illustrated) extra.

Motor equipment:— $\frac{1}{4}$ H.P. 110 Volt AC 60 cycle, single phase, swivel motor mount and light—\$36.00*

* All prices FOB Chicago.



- ★ **MILLS SMALL PARTS MUCH FASTER.**
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- ★ **YOU GET A BETTER PRODUCT**—the result of ABSOLUTE ACCURACY.
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- ★ **VERY LOW MAINTENANCE.**
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- ★ **UNIQUE—VERSATILE.** Nothing else like it. One or several machines can be the answer to some of your production problems.

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50 YEARS OF SERVICE TO INDUSTRY

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Automatic Brinell hardness tester

An automatic go-no go Brinell hardness tester for production testing accepts or rejects parts at rates up to 1000 per hour.

Constructed as a revolving "three station" tester, machine automatically grinds a smooth test surface, applies

load (3000 kg.), measures depth of impression, and accepts or rejects Brinelled parts without manipulation or judgment by the operator. He merely places the parts in the holders before they are rotated to the first station.

Tinius Olsen Testing Machine Co.,
5893 Easton Rd., Willow Grove, Pa.

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PINPOINT MACHINE WEAR... MISMATED PARTS...WITH SPERRY BEARING TESTER

The Bearing Tester consists of a metal probe, or pickup, and a compact electronic amplifier. Any malfunctioning in a moving part is transmitted through the probe and shows itself by a change in the noise level and the noise pattern visually presented on the tester's calibrated dial. Lightweight, easily portable, the Sperry Bearing Tester is a positive asset to preventive maintenance, quality control, and receiving inspection.

Bulletin 61-105 describes the Sperry Bearing Tester. Write for your copy.

605 Shelter Rock Road

Danbury, Connecticut



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This tapered  V-centering Key locks the Cutter Block accurately and

rigidly assuring dependable low cost operation

of ...



McCROSKY *Block-Type* BORING BARS

Wide Range of STOCK Sizes

"SPECIALS" to meet any Requirement

Many exclusive — and shop-proved — features, available only in our design, enable you to bore more pieces in shorter time with greater accuracy. High speed, cast alloy or carbide tipped blades, Standard Bars, with straight or tapered shanks, with or without pilots, for boring holes up to 15" in dia. "Specials" often combine several related boring, facing, counterboring and chamfering operations into a single tool, cutting costs and increasing production. Write for Bulletin No. 18-B.



McCROSKY

TOOL
CORPORATION
MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

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Special vertical mill

Special 4-spindle vertical milling machine was developed to mill out two recesses in beveled gear blanks approximately 3" in diameter. It will produce up to the top speed of the operator who unloads and loads two fixtures while two piece parts are being machined in the other two fixtures. Infinitely variable feeds are available up to the capacity of any existing cutters. This machine was also designed with the view of adding 3-dimensional hydraulic tracer control at any time in the future. Production is 200 pieces per hour.

The operator loads the right-hand pair of the four rotating fixtures, pushes the hydraulic clamping lever and cycle button, unclamps the other two fixtures, unloads and loads the clamps and pushes the cycle button for the left-hand pair.

As the cycle button is pushed for either pair of fixtures, the corresponding spindles rapid traverse down to cutting position and lock in place, the table feeds in and dwells at full cutting depth, then the fixture revolves counter-clockwise to end of cut and dwells. The table then rapid traverses out until cutter is 1/16" from opposite side of the bore. Fixtures rotate clockwise in rapid traverse to second cutting position, then table feeds out and dwells at full cutting depth. Fixtures again rotate counter-clockwise during cutting and dwell at end of cut. Finally table rapid traverses out of the cut and spindles retract in rapid traverse. Pieces are now ready to unload.

The seeming complications of table and fixture reversing movements were made necessary in order that each recess might be cut by the conventional milling method.

Spindles are belt-driven by two 2 hp motors; one motor for each pair of spindles. All movements of spindles,

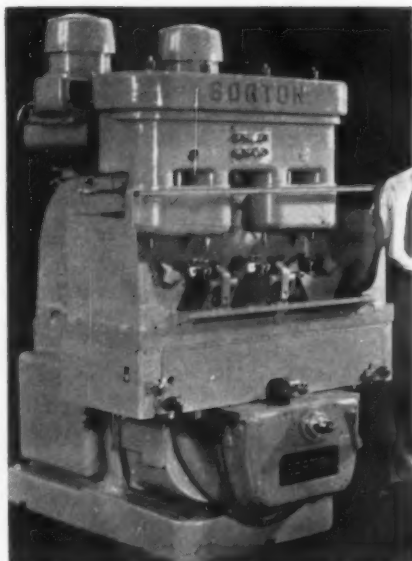


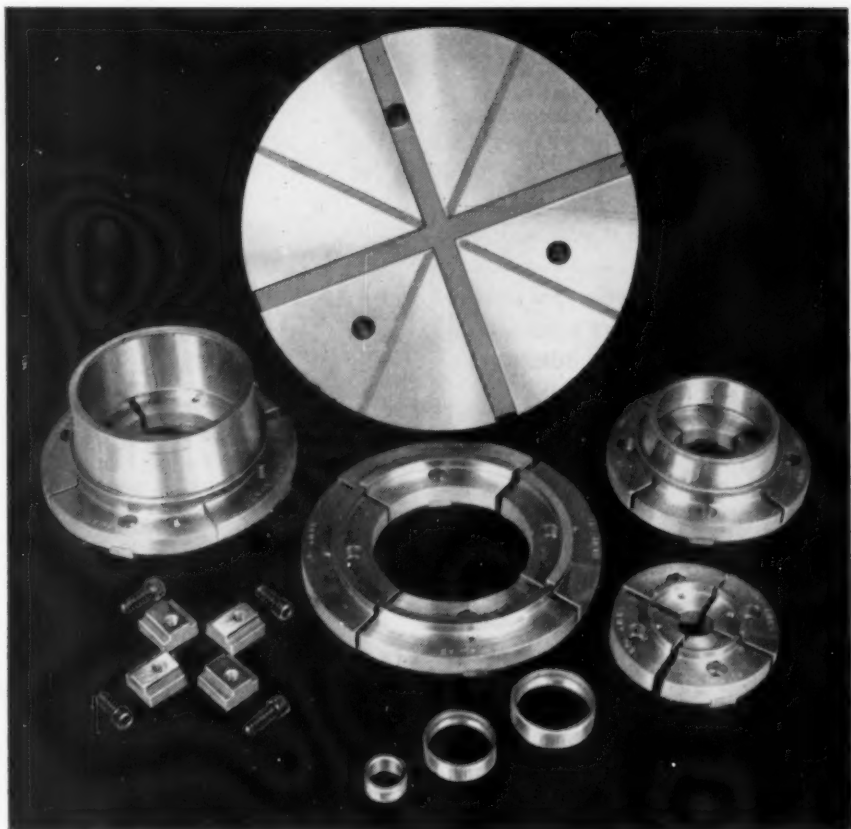
table and rotating fixtures are hydraulically actuated with interlocked electrical controls for complete safety for cutters, piece parts and the operator.

Four flute fast spiral cutters are used and approximately 150 parts are machined per cutter after which the ends of the cutters are cut off and cutters re-used. This is done twice so that 450 pieces per cutter are machined before the cutter is completely used up.

This machine was tooled for a maximum centerline distance of 4" between each recess but minor modifications would make it possible to vary this distance considerably. Many other variations are also possible such as incorporating an hydraulic valve to generate the profile, either on the inside diameter or outside diameter of a given piece part, as well as groove-type milling, keyway milling, face milling, either conventional or climb milling.

George Gorton Machine Co., Dept. RB, Racine, Wis.

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Magnetic Work Drivers— Internal or External Shoe Type Centerless Grinding

WALKER engineers have designed a rotary magnetic chuck with a T-slot type 4-pole face plate upon which segmental magnetic drivers can be used. These drivers are key guided for in-and-out adjustment to cover large range of diameters; and are attached by T-nuts. The holding force can be varied by use of neutrolator from maximum strength to a degree to allow for slippage when used in conjunction with a shoe type support.

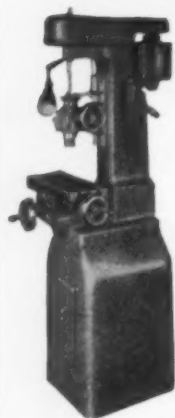
This new WALKER development has solved many of the bearing ring holding problems resulting in accuracy, speed, increased production and lower unit costs.

O. S. WALKER CO., INC., Worcester 6, Massachusetts

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Dial bore gage setting master

Dial bore gage setting master eliminates the necessity of employing master ring gages or gage blocks with surface plates in the setting of dial bore gages. A single instrument will set dial bore gages ranging from 0 to 7", regardless of make. Also offered is a second set-



Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly jig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work. Put your small work on the LINLEY where it belongs and reserve your large machines for large work, where large work belongs. You'll save money this way.

SPECIFICATIONS:
Table Movement: 8"x10"
Table Size 7"x17½"

Complete details sent promptly on request

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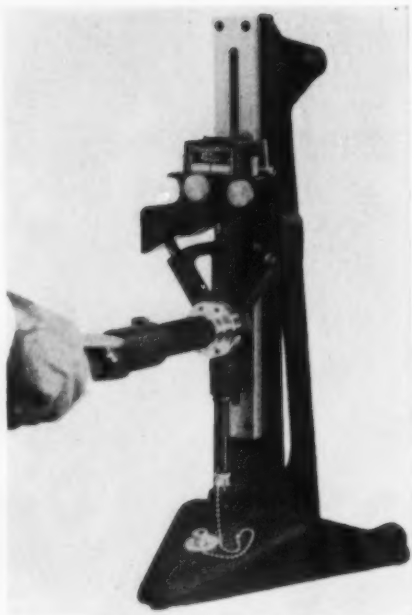


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ting master ranging from 0 to 14" as illustrated.

The instrument can be set to XX accuracy in less than five minutes with gage blocks, can be used either vertically or horizontally and can be easily carried because of its light weight.

Standard Gage Co., Inc., Dept. RS, 195 Parker Ave., Poughkeepsie, N.Y.

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CAM MILLING

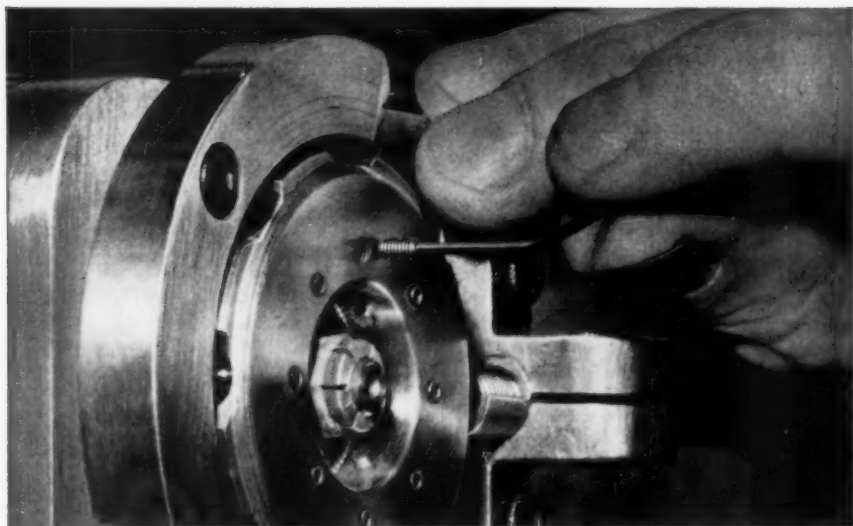
Fully equipped modern machine shop with extensive Jig Boring, Surface Grinding, Horizontal Boring and Thread Grinding facilities as well as modern Cam Milling and Cam Grinding equipment.

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Microsize UNBRAKO socket screws simplify design problems—even in highly specialized equipment like this prototype precision loading device for use in advanced automated production operations.

Miniaturize with UNBRAKO set screws



You need not design special set screws to secure your new miniaturized equipment. Microsize UNBRAKOS were developed specifically for use in modern small devices.

UNBRAKO screws are made of carefully selected alloy steel. They are manufactured to timepiece precision. Sockets are deep and uniform for greatest wrench

engagement and longest reuse. Threads are fully formed for maximum strength and exact fit. And UNBRAKOS are heat treated to the optimum condition for high tensile strength and ductility without brittleness or decarburization.

Ask your authorized industrial distributor about microsize UNBRAKO socket screws today. Or write us for Bulletin 2055 and samples. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 52, Pa.

STANDARD PRESSED STEEL CO.



SOCKET SCREW DIVISION



JENKINTOWN PENNSYLVANIA

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Plastic molding machines for small item production

Mini-Jector plastic injection molding machine incorporates small, low-cost, parting-line sprued molds of 1/3 oz. to 1 oz. cap. It is possible to develop the product and mold any quantity—dozens to thousands—in exact design and color desired for market tests, experimental purposes before tooling up for full production. In many cases, the machine will handle the entire production requirements. It will mold any thermoplastic, including nylon. Up to 30,000 psi is possible on the material with hydraulically operated model.

Machine is available in various models to suit individual requirements, includ-

ing air or hydraulic power, with simple lever or push-button controls.

Wasp type Mini-Jector is designed especially for solving difficult insert molding (encapsulating) of wires, cables, cords, rods into plastic plugs, handles, etc.

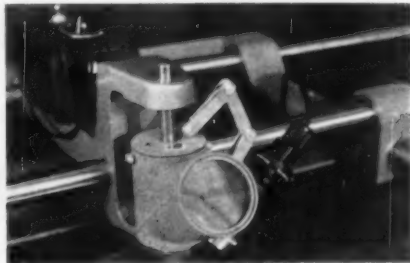
Newbury Industries, Dept. RH, Newbury, O.

Use postpaid card. Circle No. 134

Optical scope speeds printed circuit punching

This optical pick-up device has been added to the Wales fabricator-duplicator punching press for printed circuit fabrication.

Termed the "Dupl-O-Scope," it is mounted in the stylus bracket of the



duplicator to optically sight-in on a master circuit while the fabricator punches a corresponding master template. The template is then available for punching all subsequent production printed circuit boards.

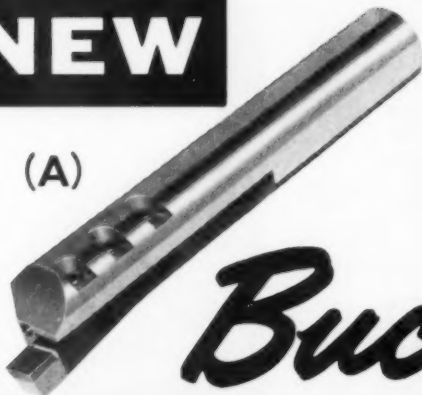
Device has fixed focus, four-power lens and prism. A standard multi-ring, single cross-hair reticule permits positive centering for punching both round and shaped holes. The external light source is adjustable, providing pinpoint to 1" diameter lighting directly under the objective lens. An 8-volt transformer, mounted on the side of duplicator, is used to reduce the 110 volt source.

Wales-Strippit Corp., Dept. RH, 345 Payne Ave., North Tonawanda, N.Y.

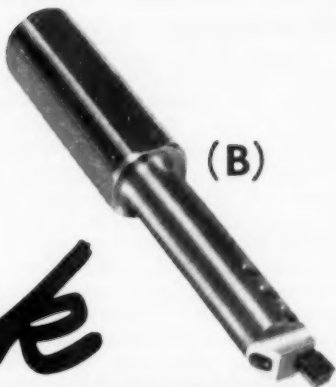
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NEW

(A)



(B)



Buck

BORING BAR

*Gives you new precision,
speed, and economy*

(A)

Shows why the Buck is more rigid and stronger. Full shank of cutter is supported by bar, locked in by three screws.

(B)

Shows adjusting screw behind cutter at end of bar. Provides adjustment to tolerances as precise as machine permits — even on 1" bars.

* * * *

There are 30 sizes of Buck Boring Bars ranging in boring capacities from a minimum of $\frac{75}{32}$ " to a maximum of 6 $\frac{1}{4}$ ".

The rigidity for heavier, faster cuts — plus precision adjustment to tenths — is now available with the Buck.

You can spot the design advantages. Cutter is "out front." Provides ample chip clearance. Permits use of bigger shank for greater strength and rigidity.

The Buck uses standard cutters. Cutting edges are always on center — means less, and sometimes no, tip grinding. This, plus super rigidity, means longer cutter wear and permits using the better grade of carbide tools.

This just begins to list the many features. Write for complete details.

BUCK TOOL COMPANY

512 SCHIPPERS LANE • KALAMAZOO, MICH.

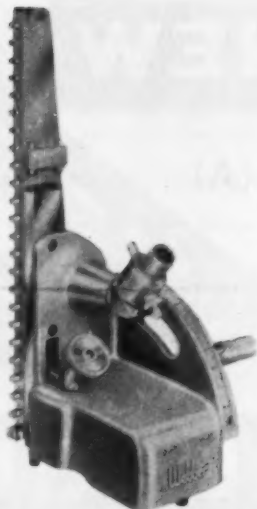
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Gage combines blocks, microscope

Optical height gage which permits fast measurements of heights up to 61 inches, with accuracies of $\pm .000005$ " per inch of height, the Micro-Accurate optical height gage, combines Webber gage blocks and the Leitz measuring microscope to give easy, accurate surface plate transfer of measurements.

The manufacturer describes the unit as basically a stack of gage blocks which are held by spring tension to the known accuracy of $\pm .000005$ " per inch of height. The stack, which is made up of alternating .300" and .700" blocks, is divided into one-inch measurements by the protrusion of the .300" blocks beyond the .700" blocks.

By means of a lever-operated cam



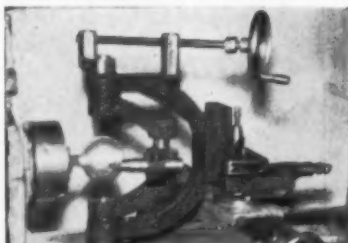
and a vernier adjustment hand wheel, the stack of blocks is easily raised and lowered over a range of one inch to obtain fast settings of measurements to .000025". These are read in the Leitz optical eye-piece and are measured from the top of the protruding gage block corresponding to the inch of height being measured. Measurements are easily and quickly transferred from this point to the work or vice versa.

Gage eliminates tedious wringing together of many gage blocks to obtain long measurements, with resultant uncertain accuracies. It also eliminates the inaccuracies of micrometer screws. Because gage blocks in this unit are never handled, measurements are always at known room temperature. Gage is available in four models, measuring to heights of 25, 37, 49 and 61 inches.

Webber Gage Co., Dept. RH, 12912 Triskett Rd., Cleveland 11, O.

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CUTS ANY RADIUS

Convex, Concave or Ball

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The accurate short cut for turning any radius. Adaptable to most any lathe.

Contact your tool supplier or write for details.

RETCO MFG. & SALES

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**1/3 DIAMOND
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**95%
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HARDNESS**

- Fast, efficient, removes material, produces an absolutely smooth finish on tool steels and on the hardest carbide tools.
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- Grains are sintered and bonded under extreme pressure. The high density and great quantity of hard grains guarantee long life and even cutting action.
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For
HEAVY abrasion on carbide tools use:
MEDIUM carbide No. 180 - Yellow
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FINEST FINISH after honing, No. 360 - Red
use No. 500 - Green

**DIAL
BENCH
GAGE
\$68.50**

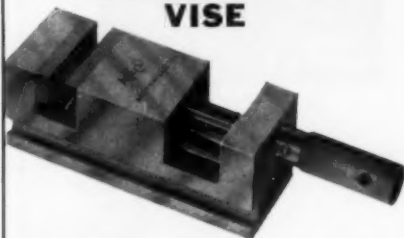
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ACCURATE
RELIABLE**

As shown
with 2
.0001" dial
indicators



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PRECISION TOOLMAKERS' VISE



ACCURACY—.0004"

FEATURES:

- (1) Precision ground on all external surfaces to a maximum permissible error for squareness of .0004" per inch. Not cumulative!
- (2) Dovetailed slide giving rigidity and parallel location of jaws under all circumstances.
- (3) Slide adjustable for wear by six socket headed screws in base allowing maintenance of parallel slide.
- (4) Hardened and ground jaws can be removed for replacement with special jaws or for reconditioning.
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- (6) Screw operated by knurled handle or bar.
- (7) Dust-proof means of oiling leadscrew, provided by screw in end of handle.
- (8) ALL PARTS HARDENED, except leadscrew which is made of High Tensile Steel for long wear.
- (9) Groove provided all round base provides means of clamping vise to machine tables, etc.

CAPACITY

	No. 1	No. 2	No. 3
Width of Jaw	1-1/4"	1-7/8"	2-1/2"
Depth of Jaw	7/16"	11/16"	15/16"
Jaw Opening	1"	1-1/2"	2"
Weight lbs.	1-1/4	4-1/8	10

PRICES

No. 1	No. 2	No. 3
\$24.50	\$38.75	\$67.50

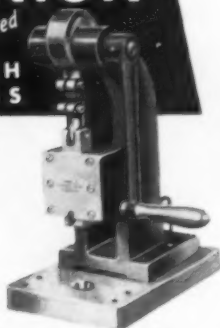
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UNION Hand-operated **PUNCH PRESS**



Distance back from center of slide $1\frac{3}{4}$ ". Width of opening in back $1\frac{1}{2}$ ". Stroke of slide $\frac{3}{4}$ ". Adjustment $1\frac{1}{8}$ ". Maximum die space $2\frac{1}{8}$ " as shown. Can be increased by blocking up between base and bottom of Press. Rated at one ton capacity. Height overall $13\frac{1}{2}$ ". Weight 46 lbs.

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UNION TOOL & DIE CO.
299 Norton St. Rochester 21, N.Y.

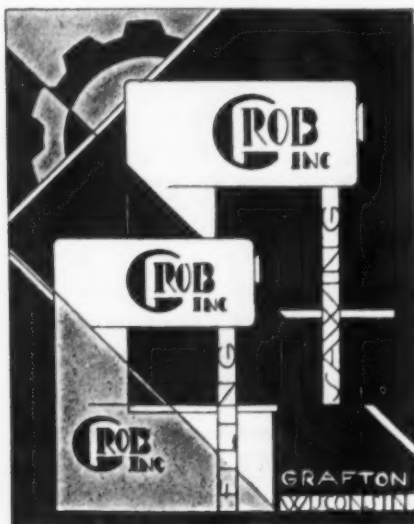
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Accessory eliminates whipping

Accessory for all hydraulically operated Di-Acro press brakes called "Let-up Control" is said to eliminate whipping and resultant kinking of sheet material during forming operations according to the manufacturer, O'Neil-Irwin Mfg. Co., 562 8th Ave., Lake City, Minn.

Basic element in the control is an adjustable flow control valve. Long sheets can be handled safely and efficiently because the speed of the ram can be reduced up to 50% just prior to the time that the die in the ram makes contact with the material to be formed. While the form part of the stroke is at slow speed, the return stroke is at maximum speed.

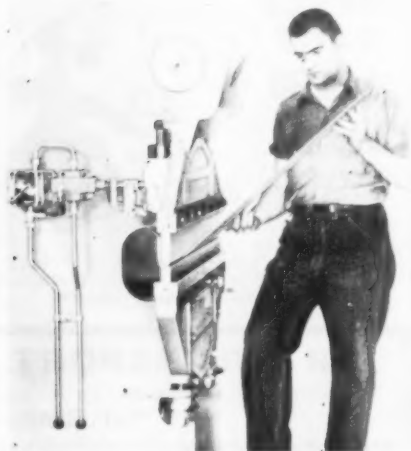
Adjustment is made on a calibrated gage which is mechanically linked to a two-way valve which opens and closes to allow hydraulic oil to flow through the flow control valve. Reduction of ram speed is particularly desirable when long sheets of material are being formed, it was pointed out, because the accident hazard for operators is re-



GROB INC.,

GRAFTON, WISC.

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duced and the sheet materials are easier to handle.

Other accessories for Di-Acro hydropower press brakes include a micrometer front operated back gage that is an aid in accurately positioning material, a special dual hand-trip control which requires the operator to use both hands to operate the ram, and a cen-

tral lubricating system that meters the proper amount of oil to each bearing.

Two models of the press brake are available. Model 16-36 forms 16 gauge mild sheet steel across a 36" bed and the Model 18-48 has maximum forming capacity of 18 gauge mild steel across a 48" bed.

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BORING TOOLS



Tools that will cut their own head diameter clean, running on dead center, proving they do have proper clearance.

No need to grind the heads of these tools away to make them cut clean.

And two-flips to give 100% more usable cutting head. Guaranteed to be good.

Send for literature and prices.

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BURR KEYSEATERS



Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erecting, and repair work.

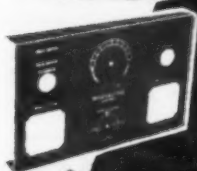
ALSO Planer-type MILLER up to 144" table length.

Write for Bulletins and prices.

John T. Burr & Son, Inc.

429 Kent Avenue
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NAMES AND NUMBERS

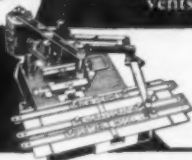
on equipment, parts, panels, etc.

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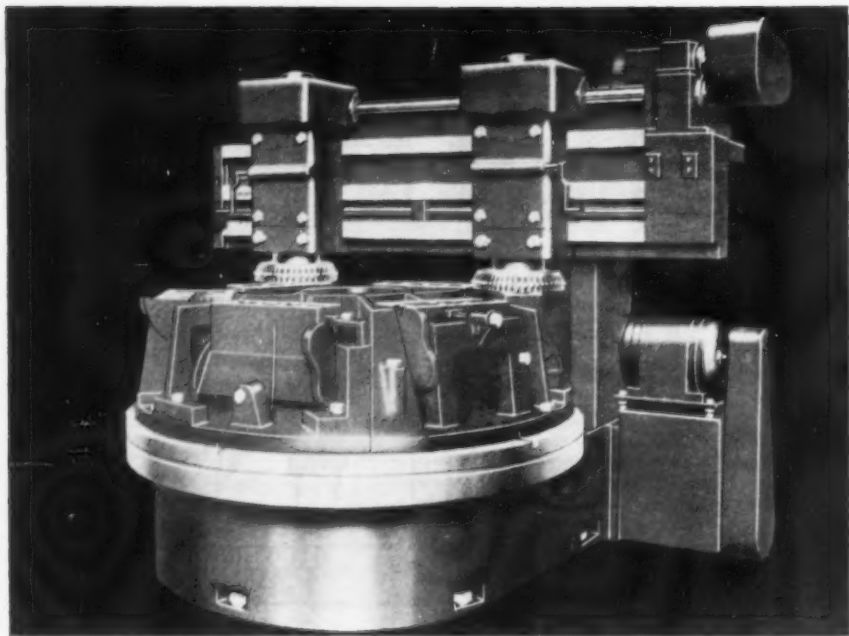
Do all your marking fast, on-the-spot, with unskilled labor. Use portable, tracer-guided ENGRAVOGRAPH. Over 17,000 in use.

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Rotary Milling Machine

A continuous, rotary milling machine, a high-production tool with circular table and twin spindles, is of box-type construction, with columns and cross-rail cast integral and bolted to the bed for rigid application of the cutters to the work. The machine is claimed to permit extremely accurate milling. The

work is fed continuously in multiple setups to the milling cutters.

The fixture arrangement allows flexible setups. Finished work can be taken off the table and new work put on while the table is moving and the cutters operating.

The spindle heads are independently

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**OUTPERFORMS
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Cut production time without sacrificing accuracy! Easy to set, easy to see, eliminates necessity of guard removal. Somerset Radius Dresser turns "tricky" jobs into routine operations.

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MACHINE and TOOL BLUE BOOK

adjustable vertically and horizontally, enabling the operator in one pass to rough cut with one cutter and at the same time finish with the second, or to rough or finish on two levels in two different cutting circles.

Powered with variable-speed drive, the table, which rides on anti-friction bearings, can be set for speeds up to 100 inches an hour. Diameter of the table is 72 inches.

CAMS

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Machine Tool Department, Box 156,
Hamilton Div., Baldwin-Lima-Hamilton
Corp., Hamilton, O.

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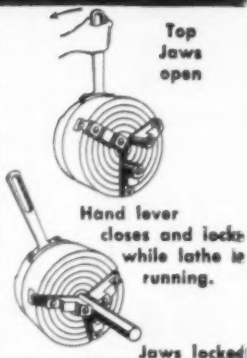


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that are actually "worn" undersize during manufacture before they are ever used. Second, it gives you finer, more practical accuracy . . . with the sure knowledge that every Ellstrom block you buy will start wearing toward its nominal size rather than away from it. And third, it gives you a guaranteed minimum wear factor equivalent in millionths to the full minus tolerance specified as standard for all other makes of blocks!

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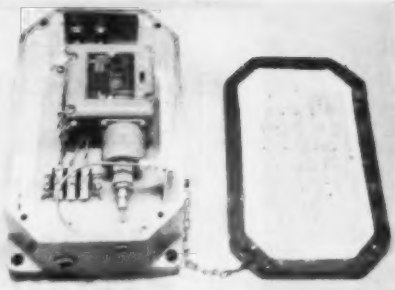
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tool, cutter, die or knife damage or breakage. The machinery cannot then be restarted until the failure has been corrected and pressure restored. Unit is applicable to any type of machinery requiring protection against loss of pressure in forced feed lubrication systems.

Seneca Falls Machine Co., Dept. RS, Seneca Falls, N.Y.

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Drives Anything Between Centers

For Work Diameters 1/4 to 6 7/8"

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Model
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by complete change of austenite to martensite.

TOUGHEN METALS, increase hardness and life of perishable tools up to 400%.

STRESS-RELIEVE CASTINGS of magnesium, aluminum and cast iron . . . with SUB-ZERO Chilling!

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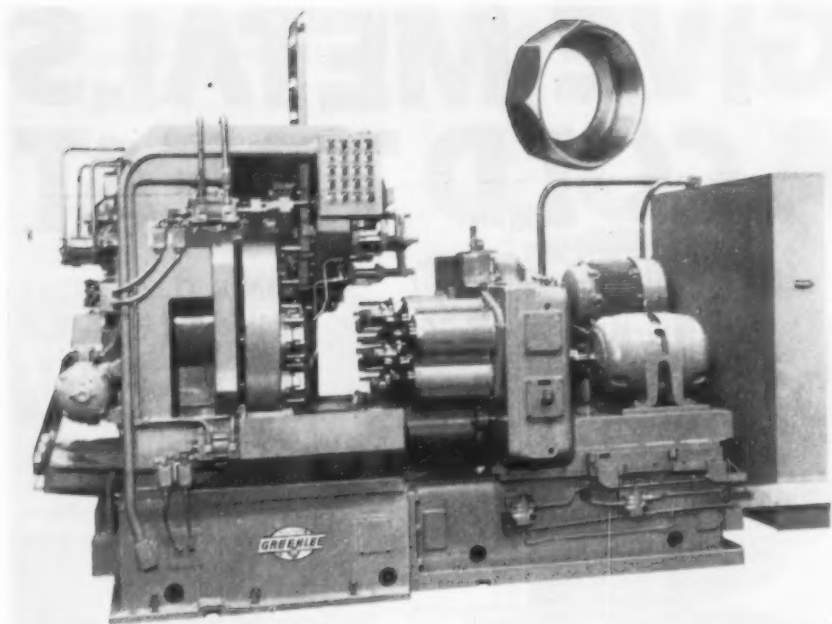
3930 P-7 Reading Road

Cincinnati 29, Ohio

May, 1957

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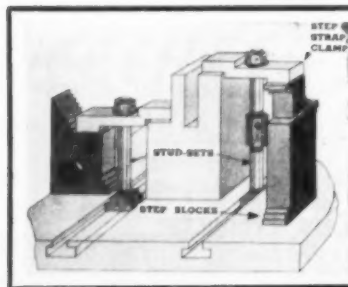
143



Horizontal Indexing Machine for Machining Pipe Fittings

This one-way, 5-station, horizontal automatic indexing machine was built for high-production machining of malleable-iron pipe fittings. The parts are automatically loaded, four at a time,

into the workholding fixtures at station one, by a magazine-type loading arrangement. They are then automatically indexed into the remaining four stations where the following machin-



SURE GRIP STEP BLOCKS

Clamping tools of all types

Write for free tracing templates

TIETZMANN TOOL CORPORATION

Dept. C. T.

Englewood, Ohio

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ing operations are performed: Two diameters are combination-bored, chamfered, and rough counter-bored in the second station, and a finish counter-bore and chamfering operation is performed in the third station. The tapping operation is performed at station four and the parts are automatically unloaded in the fifth station.

The machine is designed to handle a variety of five different sizes of pipe fittings, ranging from 1 1/4"-12 thread to 2"-14 thread at a gross production rate of between 576 to 712 pieces per hour, depending upon the size. To accommodate these different sizes the machine is equipped with interchangeable clamping fixtures, facilities for changing spindle speeds, and interchangeable lead-screw tap spindles for the different thread leads.

Greenlee Bros. & Co., Dept. RB, Rockford, Ill.

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2 IN 1

NO-DUST GRINDER



BUILT-IN DUST-EXTRACTOR

SAVE OVER 50% FLOOR SPACE
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OLD WAY
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DUST-LADEN AIR IS A MENACE!

- Protect your employees' health.
- Protect nearby machine tools from dust and grit.
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Diamond \$7.00

EASILY

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Chatter Resistant, Spring Loaded Spindle
Hardened shaft—bearing adjustable for wear.
Diamond always perfectly centered.
Easily set adjustable 180° stops.
All surfaces ground true from hole.
CAPACITY—1 1/2" Convex to 4" concave
10" Wheel size for DoALL and NORTON Grinders—\$49.00. Diamond \$7.00

Ball Thrust Bearing.
24 Precision Ground Surfaces, not just milled & chrome-plated. **DIAMOND BLOCK** Slides In Ground & Lapped Housing, Can't Chatter. Set Accurately With Protractor or Sine Bar. Largest Bearing Surfaces.

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SPERMAN METAL SPECIALTIES • 2197 E. 21st ST. • BROOKLYN 29, N. Y.

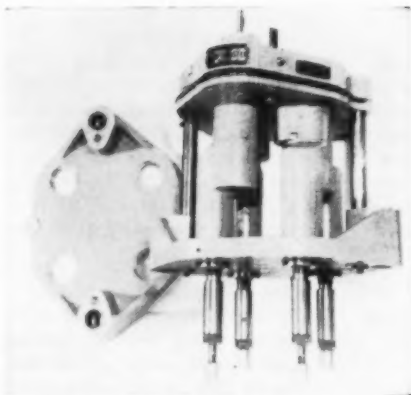
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Multiple spindle head

Multiple lead screw tapping of several parts with similar but varied hole patterns can be done with the use of the adjustable multiple spindle head illustrated.

Units of the standard line of Thriftmaster full ball bearing double eccentric adjustable drillheads were fitted with lead screw spindles to make up this new head. Bronze lead screw nuts are built into the spindle brackets in a special manner. This permits the use of ordinary templates to provide a quick means of accurately locating and locking spindles in position. Bronze bushed lugs were provided in the special templates to register with guide rods in the fixture.

A desired normal spindle travel of $1\frac{1}{2}$ " is controlled by a rotary limit switch operated through a special shaft in head. A safety feature prevents damage to the head in the event of excessive travel in either direction. Another feature built into the axial floating tap



holders guards against damage usually resulting from the absence of previously drilled holes for the taps to enter. The illustration shows two holders completely retracted with the other two in the normal operating position.

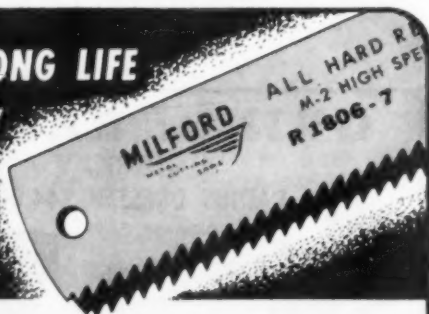
Thriftmaster Products Corp., 1030A N. Plum St., Lancaster, Pa.

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Pneumatic crimper

The Airlox pneumatic crimper was designed primarily to crimp solderless



electrical terminals. An adjusting nut with locking feature limits forward movable jaw stroke to any predetermined point in the half inch maximum jaw movement. A set screw with lock nut limits movable jaw return. This allows a fixed depth of indentation on the work, depending on the die characteristics and the capacity of the crimper. Machine also lends itself to staking applications and some types of press operations.

Specifications: over-all dimensions, 12" high by 8½" wide by 11" long, movable jaw stroke adjustable from 0" to ½" maximum travel, developed squeeze on work, 50 times air line pressure.

Production Devices Inc., Dept. RS,
Whitehall, N.Y.

Use postpaid card. Circle No. 142



Threaded inserts employing a self-locking principle are now available as small as size No. O. They eliminate the need for special tools, tape or counterboring, and can be installed in a standard threaded hole and removed with a screw driver. Self-locking principle provides a locking action on both internal and external threads.

The Nylok Corp., Dept. BB, 620 Industrial Ave., Paramus, N.J.

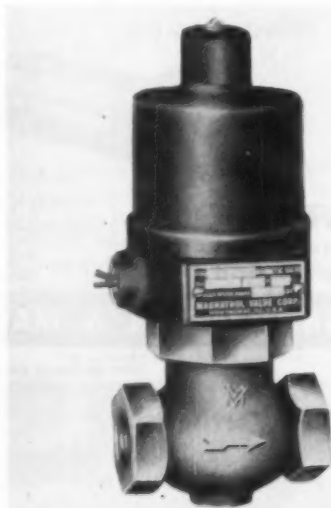
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Full port solenoid valve

A normally open solenoid valve, Type AR, has full-port capacity and is engineered for the automatic control of water, brine, solvents, gas, air. Featuring a completely tight shut-off when solenoid is energized, valve is recommended also for control of vacuum lines.

It is cast of high pressure valve bronze in the globe pattern, has screwed ends and is available in sizes from 1/2" to 3" with pressure ratings to 300 psi. The valve is single-seated, and is closed by a standard Jenkins-size resilient disc. The valve opens instantly when the solenoid is energized.

Removable operating assembly permits quick disassembly of the valve for inspection and cleaning without disturbing either the line or the electrical feed (where flexible conduit is used). This feature is important in high-cycling operations which eventually produce wear on the operating parts. In these applications, the complete



operating assembly may be quickly replaced from stock.

Magnetrol Valve Corp., Dept. RS, 71 Fifth Ave., Hawthorne, N. J.

Use postpaid card, Circle No. 144



DYKEM

STEEL BLUE

Stops Losses

making Dies and
Templates

Popular package
8-oz. can fitted
with Bakelite cap
holding soft-hair
brush for applying right
at bench; metal surface
ready for layout in a few min-
utes. The dark blue background
makes the scribed lines show up in
sharp relief, prevents metal glare.
Increases efficiency and accuracy.

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THE DYKEM COMPANY
2301G North 11th St. • St. Louis 6, Mo.

Use postpaid card, Circle No. 511

Heavy-duty CO₂ regulator, Oxweld R-69-400, was designed for use on carbon dioxide cylinders or manifolds. It has a large capacity and wide work range. Effective operation is possible at any delivery pressure up to 200 lb. per sq. in. Regulator operates on a two-stage principle of pressure reduction. Linde Air Products Co., 30 E. 42nd St., N. Y. C.

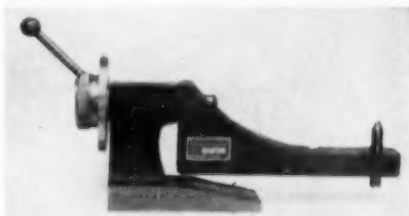
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Radius dressers

Radius dressers in three sizes for up to 14", 20" and 24" diameter grinding wheels have a capacity of from 5" concave to 2" convex radii. In order to cut down chatter these radius dressers are heavy, from 20 to 22 lb. in weight, yet because of the lever action handle they handle as easily as a 7" radius dresser, the manufacturer claims. They have a 3/4" hardened, spring-loaded spindle, riding in a honed bearing that is adjustable for wear. All surfaces are ground parallel or square from the bearing hole, thus insuring accuracy.

Fully adjustable stops enable the

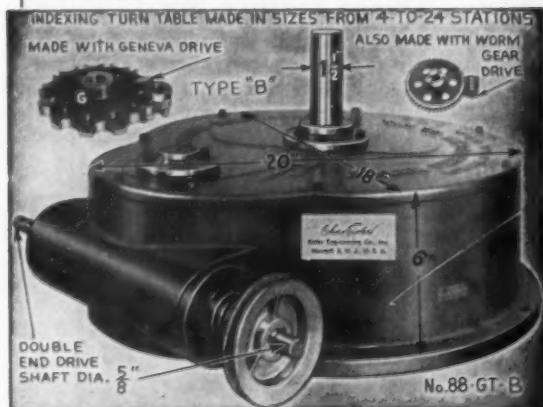


radius to be stopped at any point from 0 to 180°. Dressers work underneath the wheel, so there is no necessity to remove the wheel guard.

Sperman Metal Specialties, Dept. RS, 2199 E. 21st St., Brooklyn 29, N.Y.

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INDEXING MACHINERY — CAMS — GENEVA GEARS — TURNTABLES



MFG. REP. WANTED
DR. CHARLES EISLER ME. FOUNDER

ASK FOR CATALOG No. 88-57
CHARLES EISLER, JR. PRES.

EISLER ENGINEERING CO., INC.
762 SOUTH 13th STREET

NEWARK 3, NEW JERSEY

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Die-protecting press control

Electronic-mechanical press control prevents tool and die damage caused by mechanical overload. The Circuit Mas-

ter Mark II was designed for use on automatic equipment such as presses and molding machines equipped with a solenoid or clutch-type release. Control is composed of a sensing assembly consisting of a compensating contactor mounted on the stationary part of the machine and a bumper mounted on the movable part. The contactor is connected by a single lead to a small and compact control unit containing a visual indicator and a switch, if desired.

Mechanism automatically senses the slightest mechanical overload, from practically any malfunction: faulty stock, tool dullness or misalignment, misfeeds, jams, non-ejection, freezing. Stops any automatic machines on contact, precluding expensive tool and die damage and replacement. The control is automatically self-adjusting and wear-compensating and is unaffected by normal factory temperature changes.

Wintriss, Inc., Dept. BB, 20 Vandam St., New York 13, N.Y.

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TAMMS BLUE LAYOUT DOPE

TAMMS INDUSTRIES, INC.
228 N. La Salle St., Chicago 1, Ill.

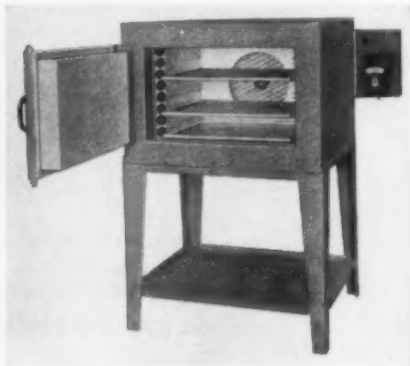
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DRYS FAST-RESISTS OIL
WON'T CHIP, CRACK OR FLAKE OFF!

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Ovens feature low gradient

Turbo-Convection ovens may be used for tempering, normalizing and drawing of both ferrous and non-ferrous metals, drying of ceramics, mold drying, welding rod storage, chemical proc-



MACHINE and TOOL BLUE BOOK

essing, curing of rubber, heat processing of plastics, paint baking.

Close heating chamber gradients of plus-minus 3 deg. F are made possible by a combination of full muffle directed forced convection and recirculation, unusual fan construction, powerful fan motor, proper controller selection, adjustable fresh air inlet and exhaust vent.

There are six standard models, ranging from 225 deg. F to 1000 deg. F and in heating chamber size from 4.75 C.F. to 27 C.F.

L and L Mfg. Co., 100 Eighth St., Chester 68, Pa.

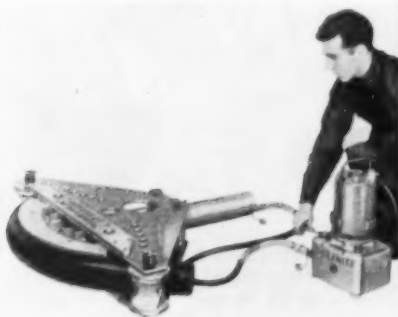
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Lightweight machine bends 4" pipe 90° with one shot

The No. 884 lightweight hydraulic bender will make a full 90° bend in 4" and smaller conduit and pipe with one ram stroke, eliminates extra set-ups. Through the use of high-strength aluminum alloy, this 40-ton bender is light enough for one man to carry the heaviest section with ease. Specially designed pipe supports serve as rollers when wheeling bender from one location to another. It can be used in any position without loss of operating efficiency.

Greenlee Tool Co., Dept. RB, Rockford, Ill.

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May, 1957



CHKP

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LANCER TOOTH—Hard edge blade with positive rake angle tooth. Permits high-speed production cutting of non-ferrous metal, wood and plastic. Cuts brass and aluminum solids and Plexiglas with equal ease.

REGULAR TOOTH—Hard edge flexible back band saw with finer tooth spacing. Cuts all ferrous metals and thinner sections of non-ferrous metal and plastic. Excellent for sawing angle iron, steel tubing, nickel plate and brass sheets.



For information-packed booklet on Metal Cutting Band Saws, write to Dept. 49, Henry Disston Division, H. K. Porter Company, Inc., Philadelphia 33, Pa.

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351

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**Anderson
NEW, IMPROVED
HAND SCRAPER**

After the original regrinding most users of this new Anderson hand scraper find that only honing is necessary. Judge for yourself: Order as many Model 5-D scrapers as you want. We'll send them promptly. Use them a full week... if they don't live up to all your expectations, send them back to us for refund.

**Faster Cutting
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Light in Weight**
18" — 20" — 22" lengths

\$6.75... with high speed steel blades

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\$1.75... for rubber bumper shown below

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MONEY-BACK GUARANTEE**

Indicate choice of high-speed steel or carbide-tipped blades, and 18", 20", or 22" lengths. We suggest you include rubber bumpers in your order. Write today for Bulletin No. 5-5.

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Air-powered lock hammer

Air-powered Pittsburgh lock hammer turns sheet metal locking edge in seconds, in one pass. Easily handling 30 to 24 gauge sheet metal, the portable



hammer is also available for heavier gauges.

Modern Mfg. Co., Dept. BB, Willow Grove 1, Penn.

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"It certainly teaches a fellow a lesson about being careless around moving machine parts; this is my 5th lesson."

BUZZER
REG. U. S. PAT. OFF.**INDUSTRIAL****GAS****EQUIPMENT****BURNERS & FURNACES (Heat Treating, Melting, Soldering)****NO BLOWER OR OTHER POWER NEEDED***... just connect to gas supply!*

Outstanding service since 1911! Each unit, with the famous "BUZZER" Venturi, delivers the hottest, quickest heat attainable without a blower. Full range control of heat and turn-down. Standards or specials available for manufactured, natural or liquefied gas applications.



Bench Type Oven Furnaces



Atmospheric Pot Furnaces

Write for New
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Bench Presses

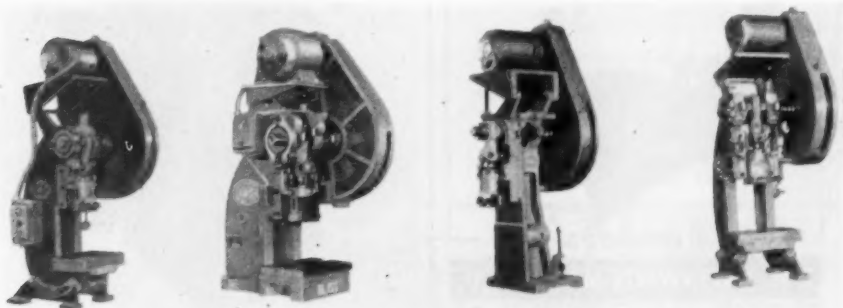
A new line of bench presses which has been especially developed for the electronic, electrical and light metal-working industries includes a four-ton adjustable bed and horning press, four- and seven-ton inclinable presses and a ten-ton fixed bed press.

The line features an extra long slide,

renewable ball seats and bronze ball cap bushings, cast Meehanite frames, split-bronze bearings, and extra-long, removable V-type gibbing. Presses can be equipped with rolling key clutch or an air friction clutch.

E. W. Bliss Co., Dept. RH, Canton, O.

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Cutters

These are some of the metal-working tools we make and stock. The exceptional service they give is the result of design, materials, workmanship & testing. 69 years of experience goes into every Lewthwaite tool—and it shows!

Punches

If you punch, cut or bend metal, we will be glad to send you a set of catalog sheets covering our complete line and giving prices.

We take pleasure in making our tools so good that you'll take pleasure in using them.



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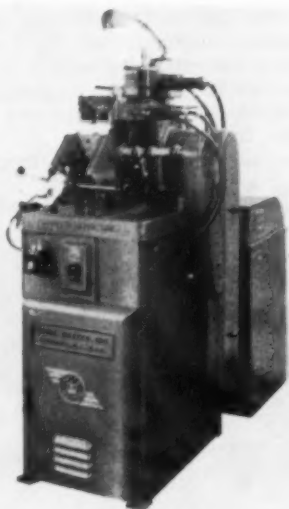
312 East 47th Street, New York 17, N.Y.

Centerless grinder

The TG-12 centerless grinder may be used with tungsten carbides, steels, stainless, plastic, ceramic, glass, hard rubber, carbon, wood, fibre, cork and nonferrous metals. Tests and comparative analyses of the type of work processed in the field over a period of two years have indicated that the machine, in two- and three-shift production applications, easily gives tolerances of .0002 inches, consistently proves 6-8 microinch finishes in either production use or single unit processing.

It handles work from .004 to 1½ inches in diameter; may be used for either plunge or through-feed grinding with conversion to either in minutes. It features increased ease and speed of setup time through greater accessibility to work zone area, rapid replacement of the work wheel, a hydraulic system incorporated for automatic cycling and wheel dressing.

Warm-up time has been eliminated through the incorporation of precision pre-loaded ball bearings in the spindle



design. This feature is important to small shops and tool rooms that would use the machine intermittently. Precision lathe work usually can be eliminated by finish grinding to the required accuracy.

Royal Master, Inc., 220 State Highway 23, Riverdale, N.J.

Use postpaid card. Circle No. 153

Chrome cleaner

This chrome cleaner eliminates hard scrubbing and rubbing. Sprinkled on a moist sponge or coarse cloth, it wipes the rust away.

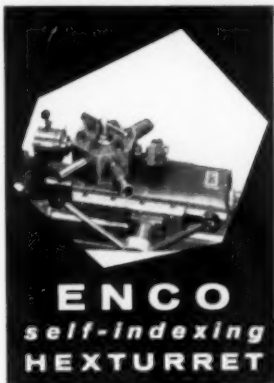
It removes rust and grease from automobile bumpers and chrome, chrome plumbing fixtures, copper utensils and fixtures, chrome appliances, enameled metal surfaces, stainless steel.

Rooto Corp., 17319 Wyoming Ave., Detroit, Mich.

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how **DOUBLE** means constant accuracy!

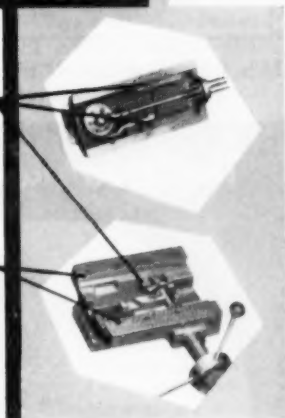


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steel gears and
racks equalize
feed of tool on
work, prevent
twisting, assure
precision

Double Gibs
Heavy duty
type with close
adjustment for
maintaining
constant
accuracy



- Custom-built to fit all lathes from 9" to 16".
- All bearing surfaces hand scraped
- All parts of indexing mechanism hardened to assure accuracy.

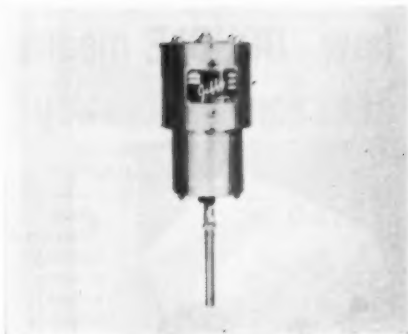
There's an ENCO turret for every lathe.
Write today for Catalog No. 53.

ENCO

Manufacturing Co. • 4524 W. Fullerton

Chicago 39, Ill. • Dept. 257

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Disintegrating machine

The Model J-1 disintegrating machine is only 8" long and 5" in diameter. Chuck into any drill press, connect to water line and plug into 115 volt outlet. It will quickly burn out broken taps, drills, etc.

Jiffy Disintegrators, Inc., 1503 E. 11 Mile Rd., Royal Oak, Mich.

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Pins set closer on rolls, bars

Robert A. Main & Sons, Inc., 50 Pascack Rd., Paramus, N. J., manufacturers of pinned rolls and pinned bars of various shapes and lengths, have announced that they are now able to produce



their products with pins closer together than ever before possible, making many holes in a small area.

They also manufacture pinned rolls and bars for applications such as take-up rolls, feed rolls. Rolls can be made for wet or dry, hot or cold applications in all diameters and in various lengths up to 24 feet long.

Robert A. Main & Sons, Inc., Dept. RS, 50 Pascack Rd., Paramus, N.J.

Use postpaid card. Circle No. 155

The Dearborn AUTOMATIC INDEXER . . .



connected to a Dearborn chucking fixture does all except put the piece in the collet.

THE CHUCK

is closed automatically
is indexed automatically
is opened automatically

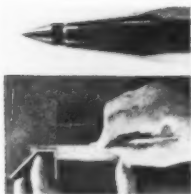
THE PIECE

is knocked out automatically

*Write for
illustrated literature*

J. W. DEARBORN and CO.
72 CLIFF ST. ANSONIA, CONN.

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A lightweight tool, the Micro-Scriber, can be used to scribe or etch all metals including hardened steel, aluminum, corrugated sheet, brass, bronze, monel. Its solid carbide tip is diamond ground and precision lapped mounted in a polished aluminum handle—hexagonal in shape so it won't roll. Greist Mfg. Co., Dept. DR, New Haven 15, Conn.

Use postpaid card. Circle No. 156

End mills cut aluminum

Ski-Kut end mills, for cutting aluminum, have a narrow primary flute face which minimizes the adherence of chips to it, a problem which contributes largely to the difficulty in milling aluminum. The helix angle of 45° makes possible a smoother shearing action. Hammering is practically eliminated. End mills are available in sizes from 1/4" to 2" in various lengths.

The Weldon Tool Co., Dept. RH, Cleveland, O.

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NEW NESTING TYPE

TOTE PANS

Sturdy 16 ga. metal.
20" long x 12" wide
x 6 1/4" deep. Drag
holes and handles at
both ends.

J. L. LUCAS & SON, INC.
Bridgeport 5, Conn.

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Cut Costs on Hole-Cutting! USE THE NEW . . . BOREMASTER

Finished holes
1 1/2" to 1 3/4"
diameter to a
depth of 8"
on your pres-
ent equip-
ment.



BOREMASTER is not just another Trepanning Cutter, but a real heavy duty tool. Stock is removed in one piece eliminating waste. Remember . . .

TIME SAVINGS + MATERIAL SAVINGS
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Also without pilot, and shorter
shank for Turret Lathes, etc.

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404 4th Ave., Dept. MT,
New York 16, N.Y.

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May, 1957

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Eliminate excessive overhang of your center. Use the accurate, rugged, reliable "NIROL". The spring loaded Live Center that compensates for expansion and contraction in actual operation.

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for complete
information.
*Reg. U.S. Pat. Off.



***NIROL MANUFACTURING COMPANY**
900 H'WAY 22, N. PLAINFIELD, N. J.

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Oil inducer for deep hole drilling

Balanced oil pressure of this heavy duty oil inducer eliminates metal to metal or mechanical seals, provides a frictionless unit which reduces oil temperature build-up to only 1°F over normal oil pump output. There is a constant pressure flow of oil at the drill cutting point. Chips are continually flushed out, drills cut fast, accurately and have a long life.

With this oil inducer gun drills are easily adapted to all types of equipment for drilling and boring operations. It is also available for all types of oil hole drills. Faster drilling at higher speeds has lowered the costs for deep hole drilling, the manufacturer claims.

Models 6000-6010 are for direct attachment to vertical or horizontal drilling equipment. These are available with tapered shank, straight shank or flange.

Model 5000 is a high speed, high pres-



sure unit to be used with hollow shafts or spindles. This unit is for attachment at the shaft end for transfer of oil to actuate clutches, power cylinders or deliver coolant for drilling.

Acromatic Tool Co., Dept. BJ, 21150 Coolidge Rd., Oak Park, Mich.

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KEO

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and COUNTERSINKS

- Both old and new series carried in stock for immediate delivery. Finest high speed steel. Ground spiral flutes. New standard simplifies and improves size progression. New comparison chart mailed on request. Shows new standard sizes—both plain and bell type. Specials to your blue prints.

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KEO CUTTERS

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"I know it's your day off, but sneak out the back door and let him welcome you home. You know his day is ruined if he doesn't."

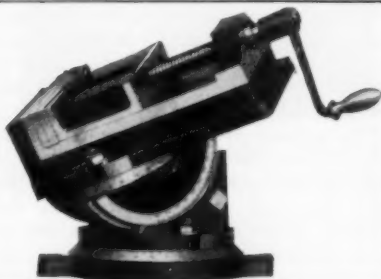
SET UP COMPOUND ANGLES INSTANTLY!

Now save valuable time on intricate, angular set-ups with the fully universal MASTER MULTI-SWIVEL VISE. Three swivels instantly set any compound angle. Used worldwide. Interchangeable platens optional.

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DONOVAN MFG. CO.

60 Batterymarch St. Boston 10, Mass.



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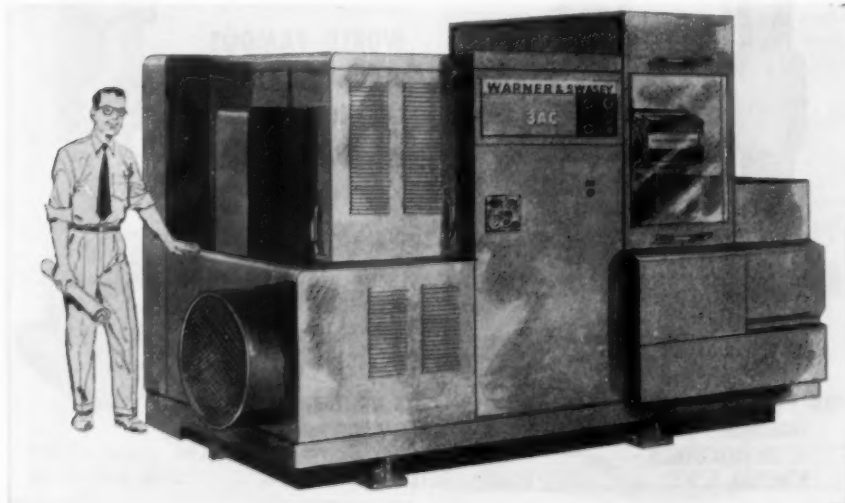
Single Spindle Chucking Automatic

Engineered for fast, automatic machining of large, complex workpieces in one operation, the 3AC single spindle chucking automatic combines accuracy, quick setup, and ease of operation; it may be used for short or long production runs of large size precision work.

During the machining cycle, regulation of spindle speeds, feed changes, cutting stroke length, turret indexing and both front and rear cross slide operation is automatic. Speed and feed changes can be made under cut to maintain optimum cutting conditions.

The machine operator has only to load the workpiece, press the cycle start button, and then unload the finished work when machining is completed. As many duplicate pieces as desired can be produced in succession without re-setting the machine controls.

Quick setup is obtained through a simple placement of switch operating screws in the index control drum which regulates the various machine functions, and by setting easily adjusted trips on the machine's pentagonal control drum for desired feed rates, spindle speeds,



and cutting stroke lengths. No cam changing is required; the simplicity and accessibility of both the adjustments and tooling stations permit rapid, accurate setup.

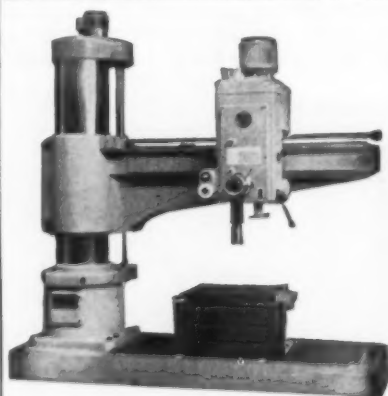
The rugged overhead turret is positioned above areas of cutting chip, coolant, and dirt accumulation for long-life accuracy, and it is offset from the spindle centerline to facilitate workpiece loading. By mounting both the turret and spindle bearings in the same housing, greater accuracy is provided and precision workpiece tolerances are maintained without constant adjustment of cutting tools to compensate for changes caused by temperature effects. The turret location actually provides increased rigidity for large diameter work, since the larger the workpiece the closer the cutting tools are placed to the guiding ways.

The versatile cross slide units of the machine make possible the application of a wide variety of cutting methods.

Both the front and rear slides can be set to operate together or individually with any overhead turret face, and three cross slide functions—normal, early, and late—are applicable to either or both units. For greater cutting tool efficiency during a late cross slide cut, two automatic speed and two feed changes are available.

In addition to normal cutting operations, the cross slide units also can be used to actuate turret slide tools for such operations as internal facing, internal recessing, and back facing. When long facing operations are required on large diameter workpieces, a cutter block on the rear cross slide and a turret slide tool can be used in tandem to reduce machining time.

Any six spindle speeds—from a high range of 65 to 826 rpm, or a low range of 30 to 385 rpm—may be selected and obtained automatically during the machining cycle. An arrangement of hydraulic clutches in the speed transmis-

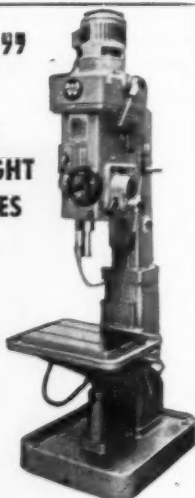


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WORLD FAMOUS RADIAL AND UPRIGHT DRILLING MACHINES

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EFFICIENT**

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DETROIT 26, MICHIGAN

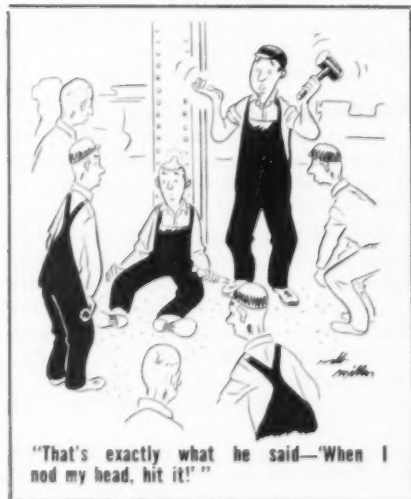
Use postpaid card. Circle No. 525

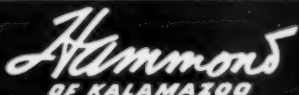
sion eliminates the need for changing speed pick-off gears.

A range of 36 feeds, from .0019" through .124", is available on the machine. Any six of these feeds may be selected during setup simply by placing the proper change gears in the readily accessible feed transmission gear box and by adjusting the trips on the pentagonal control drum. Change gears also can be furnished to lead in taps or dieheads used in cutting right hand threads from 7 to 32 threads per inch. A left hand threading arrangement is available on special order.

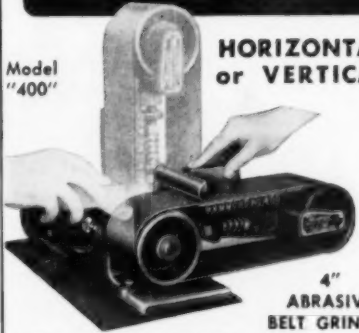
Since speed and feed changes are automatic at any time during the machining cycle, and because the 3AC can change quickly from feed to rapid traverse and back to feed again without need for manual control, substantial production time savings can be accomplished, says the company, particularly on work involving longitudinally interrupted cuts. Standard shank-type turret lathe tool holders can be used interchangeably on the machine.

The machine swings 13-1/2" over the cross slide and offers a maximum pentagon turret working stroke of 11". The






Model
"400"



**HORIZONTAL
or VERTICAL**

**4"
ABRASIVE
BELT GRINDER**

Eliminate costly hand filing, grinding and deburring... 17 abrasive belt grinders available for "101" applications in your plant. Write for bulletin.



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spindle has a 11" Type A-2 American Standard flanged nose, and is equipped with an air-operated 15" chuck. The standard drive motor is a 40 hp., non-reversing type unit. Two-speed motors and reversing motors also are available for special requirements.

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, O.

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Rust Preventive
OIL

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✓

Positive barrier against corrosion that lasts for MONTHS
Protects any metal—even delicate MICRO-finishes
Eliminates fingerprint damage and water spotting.

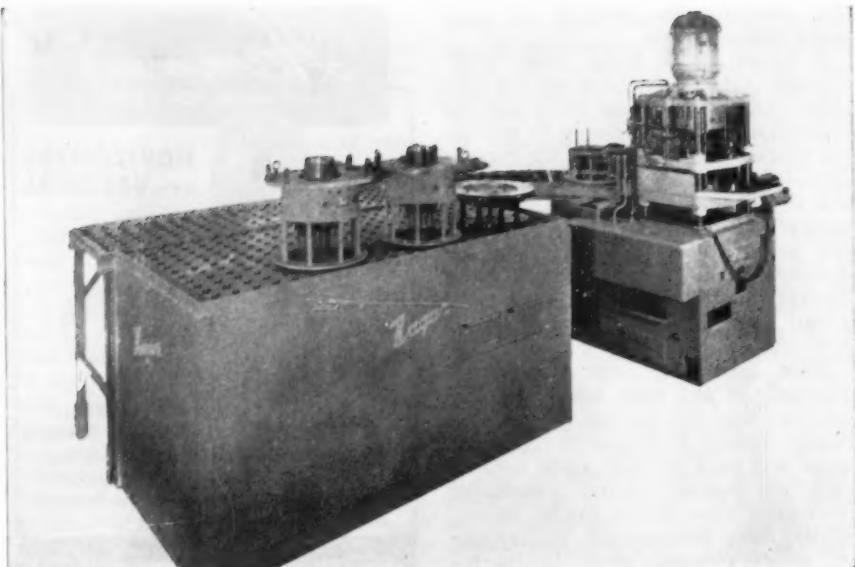
OCTAGON

Write for Data Sheet No. RP-100
"FROIL FOILS RUST"

PROCESS

15 BANK STREET
STATEN ISLAND 1, N. Y.

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Multiple Spindle Drilling

The machine illustrated shows how changing, limited, intermittent production can be done when multiple hole drilling is recommended as the low-cost solution in hole drilling. The small four-post unit houses 24" hydraulic drill heads.

The basic unit had to be designed so that changing of heads and tooling could be performed easily. The head is changed by dropping the drill head on a loading basket. Each head is carried on its own loading basket, which is rolled on a conveyor and onto the roller table. The only other act required to change the head is to remove and replace the bushing plates and locators.

The roller table serves as storage for the heads in loading baskets, and the empty loading basket for the head affixed to the drilling unit. Any number of heads appropriate to the drilling unit can be stored, thus making it possible to drill almost countless hole patterns

and any number of holes within a given area. Drill heads drill holes simultaneously, and varying diameters of holes in the same workpiece can be handled by one head.

Zagar Inc., Dept. RH, 24000 Lakeland Blvd., Cleveland 23, O.

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Extension hex keys

Ajax T-type extension hex keys provide easy alignment for the assembly of set and cap screws, especially in difficult to reach places.

Made of high tensile alloy steel, cadmium plated, large keys are one piece; the smaller keys are broached and the alloy hex pressed in. Standard Style No. 101 keys are available in fourteen (14) sizes from .050 to 1/2 hex. Set No. 14, including one of each size, has a handy rack for bench or wall mounting.

Henry P. Boggis & Co., 706 E. 163rd St., Cleveland 10, O.

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Nothing gives employees a more luxurious, satisfied feeling than that of financial security. And nothing is easier for them to achieve when you provide the convenience of automatic Payroll Savings Plan.

EVERYBODY BENEFITS

Security breeds confidence—and confidence stimulates job interest and results in steadier people who are far more efficient in their work. Receiving those crisp Bonds at regular intervals along with their paycheck is an added inducement for employees to stay on the job.

Moreover, when you install the Payroll Savings Plan in your company, you

promote not only the security of your personnel but the security of your company and your country. Over forty million Americans already have over 40 billion dollars invested in United States Savings Bonds—a tremendous backlog of purchasing power for the future.

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If your company does not now have a Payroll Savings Plan, or if employee participation is less than 50%, a letter to: Savings Bonds Division, U.S. Treasury Department, Washington, D.C., will bring prompt assistance from your State Director. He will provide application cards, promotional material, and as much personal help as you need.

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HITCHCOCK PUBLISHING CO.

222 E. Willow Ave., Wheaton, Illinois

Operations recorder

Compact operations recorder Model MDjr consists of a drum which rotates at speeds of from four minutes to 24



hours per turn, as ordered. It is used to graphically record when a machine or device is operating or when an operator is producing.

No ink is used. A stylus rests against the chart paper, which has an adherent layer of white opaque wax crystals. The pressure of the stylus exposes the contrasting color of the paper beneath, producing a slight spiral tracing on the chart.

The lead screw is also subject to an axial motion from the magnet responding to the input signal to cause vertical line. By this means, more than 400 linear inches of accurate recording can be had on a waterproof, easily filed chart measuring 6" x 14".

When the 24 hour rotation model is used, any given instant of successive days is instantly comparable, since they line up vertically. Other drum speeds are 4, 5, 15 and 60 minutes, as well as 2, 6, 12 or 24 hours.

Gorrell & Gorrell, Dept. RS, Westwood, N.J.

Use postpaid card. Circle No. 162

• SPEED REDUCERS • SPLINES •

CHAINS

ONE OR A MILLION
PRECISION
BUILT
GEARS
CUTTING ONE OR COMPLETE GEARS
1/4" TO 168" IN
DIAMETER
Metric and Non Metric

SPROCKETS

WORMS

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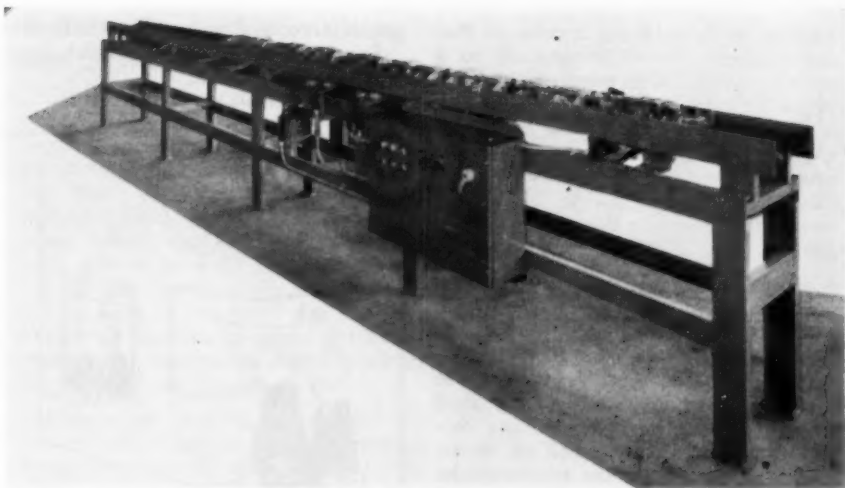
UNIVERSAL GEAR & MACHINE CO.

Mfrs. of Gears 1/4" to 168" and Metal Processing Machinery
1301 E. McNICHOLS • DETROIT 3, MICHIGAN

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MACHINE and TOOL BLUE BOOK



Electric Drive Powers Conveyor

Photograph shows automatic shuttle transfer conveyor driven by a Spurgeon Electro-Mechanical drive used to trans-

fer engine intake manifold castings from one production operation to another. This conveyor holds fourteen

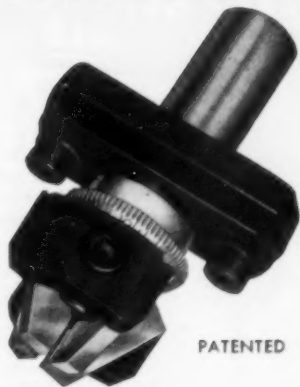
KUTMORE ADJUSTABLE HOLLOW MILLS

A MIGHTY MIDGET!

This Midget Floating Holder Hollow Mill, flange type, has micrometric adjustment, and is designed to permit easy compensation for any spindle misalignment. Small, sturdy, extremely accurate!

WRITE TODAY FOR Catalogue No. 20-BB

It shows complete line of adjustable hollow mills. Our Engineering Dept. is at your disposal for special requirements.



PATENTED

CARL WIRTH & SON, INC. 1625 CLINTON AVE. NO. ROCHESTER 5, N. Y.

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castings, each weighing approx. 40 lbs., and delivers them automatically to a preload station of a transfer machine, which it feeds. The speed of the transfer conveyor is designed for twice the speed of the transfer machine so as to keep the transfer machine loaded, even though an empty space be left on the transfer conveyor by the machine feeding it.

Drive utilizes an electric motor for shuttling a ball-bearing nut on suitable screw at a specified speed. The nut is connected to a conventional bar, equipped with collapsible dogs. These dogs push the Manifolds along steel ways, on the forward stroke, and collapse under the manifolds on the return stroke. At the end of the return stroke the dogs right themselves again and push the manifolds forward on their forward stroke. Drive eliminates the need of air cylinders, oil cylinders, oil pumps, air and oil piping with its con-

sequent control valves and solenoids. Spurgeon Co., 23501 Hoover Rd., Dept. BJ, Van Dyke, Mich.

Use postpaid card. Circle No. 163



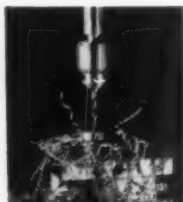
**SHALLOW HOLES...DEEP HOLES
DRILL THEM **FASTER,**
ALL **BETTER****

WITH A
Commander

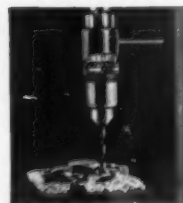
DRILL CHIP BREAKER

- ✓ Small Chips Permit 50%—400% Increase in Drilling Speeds
- ✓ Drill 10 Diameters or More in Depth Without Clearing Drill
- ✓ Better, Smoother, More Accurate Holes

Reciprocating action of the Commander Drill Chip Breaker breaks chips into small pieces that travel up drill flutes . . . permitting higher drilling speeds . . . doubles and triples production of shallow OR deep holes. Long chips which cause drill breakage, scored holes, slow jig and fixture loading, are eliminated—small, easy to handle chips flow up out of hole continuously, permitting coolant to reach cutting edge of drill. Assures longer drill life, more holes per sharpening, more holes per hour. Your nearby COMMANDER Distributor has the Drill Chip Breaker and other Commander Production Tools.



Ordinary Chips



Chip Breaker Chips

Commander MFG. CO.

4227 W. KINZIE STREET • CHICAGO 24, ILLINOIS

**Write FOR
CATALOG #851**
which describes Commander's
Production Tools

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Automatic cutter, milling and grinding machine

The Jemco automatic cutter, milling and grinding machine eliminates time consuming relieving on lathes, increases production, and turns out quality cutters. Multi-toothed and staggered tooth milling cutters for climb and conventional milling can be relief milled and form ground as well. The form grinding of each tooth provides an equal cutting load on the teeth and a better milling production, removes the hardening skin, insures a longer working life of the form ground cutters.

A template copying attachment increases the versatility of this machine by making possible the cutting of machine components such as cam segments, ratchet sections, tripping mechanisms, etc. The indexing mechanism permits the rotation of the work for repeating the form being cut on the work symmetrically or on some particular angular position controlled by the indexing mechanism—thus the machine can be used for a copying milling machine. A simple alteration allows the same template to produce cutter teeth of the same form in a range of sizes.

Simple to use, and easy to adjust, attachments are available for cutting back every second tooth or every second and third tooth, such as is necessary for burr manufacturing, cutting



acute helix end mills (spirals with infinite variation up to 30° can be cut), producing staggered tooth plane and form cutters, as well as trapezoidal thread cutters with staggered teeth,



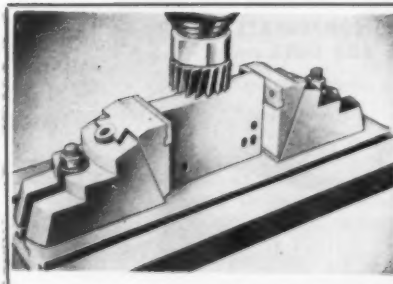
Model
UL 7120

The Leading Machine
Tool Manufacturers
use

**RUTHMAN
GUSHER**
COOLANT PUMPS

THE RUTHMAN MACHINE CO.
1817 Reading Rd., Cincinnati 2, Ohio

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MASTER GRIPPING CLAWS System Hubner WHY use them?

1. Clamping action Vertical as well as Horizontal — pressing workpiece down directly on the machine table. No hammering — no air between. 2. Gain more working room. 3. Faster and more secure setups. Easier to handle. 4. Unlimited jaw opening. 5. No straps overlapping on the workpiece; more machining surface. 6. Extremely versatile — take light cuts or heavy cuts, use on small machines or heaviest production machines.

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New York 16, N. Y.

NEISE
MODERN TOOLS

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automatic relief grinding of milled and hardened form cutters.

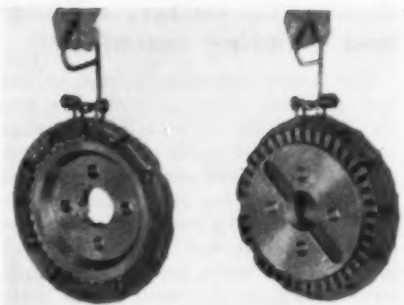
Jersey Mfg. Co., 436 Livingston St.,
Elizabeth, N. J.

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Cutter guards protect operator, cutter, machine

Cy-Co-Trol cutter guards eliminate the need for applications of hot-dip plastic, now commonly applied to cutters before storage. Guards protect the hands of the operator from the sharp edge of the cutter teeth while assembling or disassembling the cutter at the machine spindle and while handling the cutter in the cutter grind department.

Guard is made of spring steel and is simple to operate. The cutter is held by a spring pressure band to which loops are attached for easy assembly and disassembly of the cutter. These loops are used for locking the guard



and to facilitate lifting the cutter to the machine.

Guards are available for any size cutter, from 4" in diameter to 20" in diameter. Guards for cutters of larger diameters, for cut-off saws, or special shaped cutters can be supplied on special order.

Royal Design and Mfg., Inc., 4133 East
Ten Mile Rd., Center Line, Mich.

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WESPO *for ALL*

WORK-HOLDING NEEDS

TOGGLE CLAMPS

39 TYPES AND SIZES

NOTE These Features: Reamed holes—hardened serrated bushings—high tensile strength rivets.

STANDARD FIXTURE CLAMPS
16 STYLES - 170 SIZES
OVER 1000 COMPONENTS
TYPES AND SIZES

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MFG.
CO.**

26931 West 7 Mile Road **Detroit 19, Mich.**

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All-air safety circuit

All-air circuit to provide safety for operators of presses, brakes, shears and other machines features a non-tie-down special purpose valve, a single stroke valve and a three-way poppet palm button valve arrangement. Two-handed operation is required to cause a machine cycle. The buttons must be released to clear the circuit and again depressed to allow another stroke.

Non-tie-down valve has a protected adjusting screw. The regulation of this screw permits a variable time lag between the depression of the first palm button valve and the second palm button valve. The valve's own malfunctioning due to fatigue failure or foreign matter will automatically cause the system to become inoperative.

Palm button valves are available with or without a cylinder key lock. The key lock type are used in installations



requiring multiple station operation where one or more stations are occasionally locked out of the circuit.

For press applications, the single stroke valve can be used in a circuit

BEVERLY

Pneumatic **THROATLESS SHEAR**

**FASTER, EASIER
CUTTING**
to any Shape!

- Compactly built for maximum visibility and efficiency
- Operates on 35 to 150 PSI air pressure
- Adjustable power and return stroke length and speed

CAPACITY
3/16 MILD STEEL
10 GA.
STAINLESS

Beverly Pneumatic Shears combine all the advantages of Beverly Throatless Shears with fast, effortless cutting action through air cylinder operation. Air operation speeds work, permits accurate cutting to a pattern or template, as operator can concentrate on guiding work through the shear. Flow control valves permit precise adjustment of stroke speed; adjustable actuating arm controls stroke length. Foot Switch permits operator to use both hands on the work piece. Operates on 110V. 60 cycles AC and 35 to 150 PSI air pressure.

See your nearby Beverly Distributor

BEVERLY SHEAR MANUFACTURING CO.

3005 W. 111th STREET • CHICAGO 43, ILLINOIS

Write for catalog sheet
and complete details.

with the non-tie-down and palm button valves. It permits only one cycle regardless of how long the operator holds the palm button depressed and requires removing his hands and again depressing the palm button valves.

Components can be added to the circuit to provide the following functions: emergency stop, continuous, top stop, inching, pneumatic interlock, selector valve.

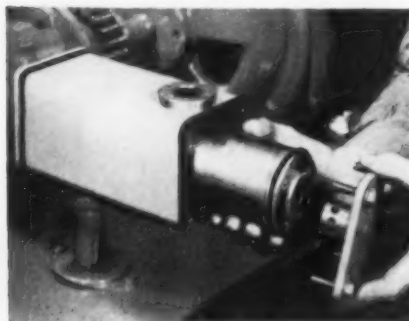
Ross Operating Valve Co., Dept. BJ, Detroit, Mich.

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Hydraulic strainer

The Telltale strainer notifies the user when it is dirt clogged, acts as a bypass valve to protect pump, provides for easy removal, and hikes the usable oil supply.

A red signal notifies the operator



when the strainer is clogged and has been pulled aside by pump suction to allow the free flow of oil around it. Automated setups can use an optional limit switch for a remote signal light. Strainer is easily removed as it is held in place only by the bolted-on end plate.

The usable oil supply is increased by up to 20% when this unit is installed because the oil inlet pipe (no longer carrying a strainer) can be lowered farther into the tank.

The Rosaen Co., 1776 E. Nine Mile Rd., Hazel Park, Mich.

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Long-wearing gages

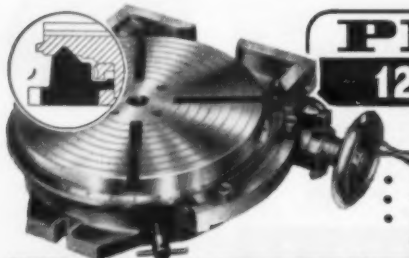
Long-wearing plain plug gages, trade-named Ritoloy, have a surface made of an extremely hard, wear-resistant



nickel alloy. It has a low coefficient of friction, is non-magnetic and non-sparking. Alloy goes deeper than the most generous wear allowance and is completely fused to the base metal.

Rite-O Tool and Gage Co., 321 W. Ten Mile Rd., Hazel Park, Mich.

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PRECISION 12" DIVIDING TABLE

For Accurate & Rigid Machining

- Reads to 1 minute using vernier on table itself.
- Table rotates on a vee way close to perimeter.
- Table can be locked in any position without distortion.
- Arranged for vertical and horizontal mountings.

Other sizes and types. Details on application.

ELISHA PENNIMAN, 460 South Main St., West Hartford 10, Connecticut, U.S.A.

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MACHINE and TOOL BLUE BOOK

A Hitchcock Publication

Wheaton, Ill.

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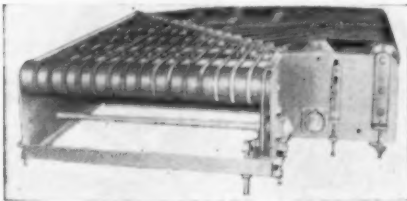


with Amidon Fittings
and one inch pipe.

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Interview with Heinz Nordhoff. The dynamic general director of Volkswagenwerk tells Editor Schleicher about the production problems faced in turning out the Volkswagen.

Production techniques at Volkswagenwerk. This 17-page picture story of the automobile plant in West Germany, highlights the machining methods used to produce the crankshaft, camshaft and trailing link arms of the Volkswagen automobile.

Contour Machine Sawing. Tool moves, work is stationary. The DoAll Company's Model 5 has a work capacity of 70 square feet and can take a straight cut 14½ feet long.

Welded base for chucker provides greater rigidity, less weight and improved appearance. Demands for increased convenience of loading, tool adjustment and gauging of the work during set-up dictated the redesign.

How Triple Cut Planing Saves Machining Time. Heavy cuts in both directions with equal feeds, speeds and depths of cut is possible with the new Universal Planer, product of G. A. Gray Co. The double cutting technique can be simultaneously combined with the single cutting feature to get "triple cut planing."

Should you repair or replace your drilling machine? The author evaluates the "when and how" to replace a drilling machine in the average size shop.

News of Automation. Pratt & Whitney have developed a new system of numerical control as applied to its line of jig borers, vertical hole grinders and rotary tables.

Shop Hints. Several pages are devoted to helpful production pointers.

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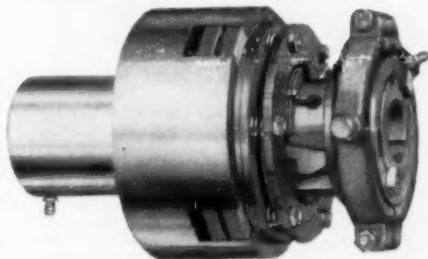


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DIAM- ETER	WIDTH OF FACE	SIZE OF HOLE	PRICE EACH
4	7/32	1	11.40
4	9/32	1	13.35
4	5/16	1	13.70
4	7/16	1	15.05
4	9/16	1	17.15
4	11/16	1	18.10
4	13/16	1	20.85
4	15/16	1	22.95
4	1	1	23.65
4	1 - 1/8	1 - 1/4	25.75
4	1 - 1/4	1 - 1/4	28.35
5	1/4	1	17.50
5	5/16	1	17.80
5	3/8	1	19.70
5	7/16	1	20.95
5	9/16	1	23.55
5	11/16	1	26.30
5	13/16	1	28.35
5	7/8	1 - 1/4	30.50
5	15/16	1	31.50
6	1/4	1	21.60
6	5/16	1	22.10
6	3/8	1	23.70
6	7/16	1	25.30
6	9/16	1	31.20
6	11/16	1 - 1/4	33.45
6	13/16	1 - 1/4	35.75
6	7/8	1	36.65
6	15/16	1 - 1/4	38.50
8	1/4	1	47.70
8	5/16	1	49.70
8	3/8	1	51.05
8	7/16	1	53.70
8	1/2	1	54.55
8	9/16	1 - 1/4	56.65
8	5/8	1 - 1/4	57.50
8	11/16	1 - 1/4	59.35
8	13/16	1 - 1/4	60.50
8	7/8	1 - 1/4	62.20
8	15/16	1 - 1/4	63.85
10	1/4	1 - 1/2	87.85
10	5/16	1 - 1/2	88.90
10	3/8	1 - 1/2	83.75
10	1/2	1 - 1/2	92.30
10	5/8	1 - 1/2	105.35
10	3/4	1 - 1/2	121.50
10	7/8	1 - 1/2	131.95
10	1	1 - 1/2	136.70
12	1/2	1 - 1/2	153.95
12	5/8	1 - 1/2	169.75
12	3/4	1 - 1/2	174.35
12	7/8	1 - 1/2	220.10
12	1	1 - 1/2	236.60

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DIAM- ETER	WIDTH OF FACE	SIZE OF HOLE	PRICE EACH
5	1/4	1 - 1/4	20.95
5	5/16	1 - 1/4	21.85
5	3/8	1 - 1/4	23.20
5	5/16	1 - 1/4	30.80
6	7/16	1 - 1/4	31.85
6	9/16	1 - 1/4	36.70
6	11/16	1 - 1/4	40.05
6	13/16	1 - 1/4	42.15
6	15/16	1 - 1/4	44.55
8	5/16	1 - 1/4	63.20
8	7/16	1 - 1/4	66.80
8	9/16	1 - 1/4	70.55
8	11/16	1 - 1/2	75.65
8	13/16	1 - 1/2	79.35
8	7/8	1 - 1/2	83.25
10	1/4	1 - 1/2	87.35
10	5/16	1 - 1/2	87.80
10	3/8	1 - 1/2	89.10
10	7/16	1 - 1/2	90.15
10	1/2	1 - 1/2	95.70
10	5/8	1 - 1/2	99.75
10	3/4	1 - 1/2	110.85
10	7/8	1 - 1/2	113.10
12	1/2	1 - 1/2	129.35
12	5/8	1 - 1/2	139.20
12	3/4	1 - 1/2	160.45
12	7/8	1 - 1/2	170.95
12	1	1 - 1/2	181.45
12	1	1 - 1/2	221.65
12	1	1 - 1/2	238.95

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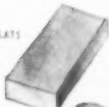
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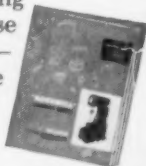
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